SOIL SURVEY

of

GUYSBOROUGH COUNTY

Nova Scotia

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NOVA SCOTIA DEPARTMENT OF AGRICULTURE AND MARKETING

and

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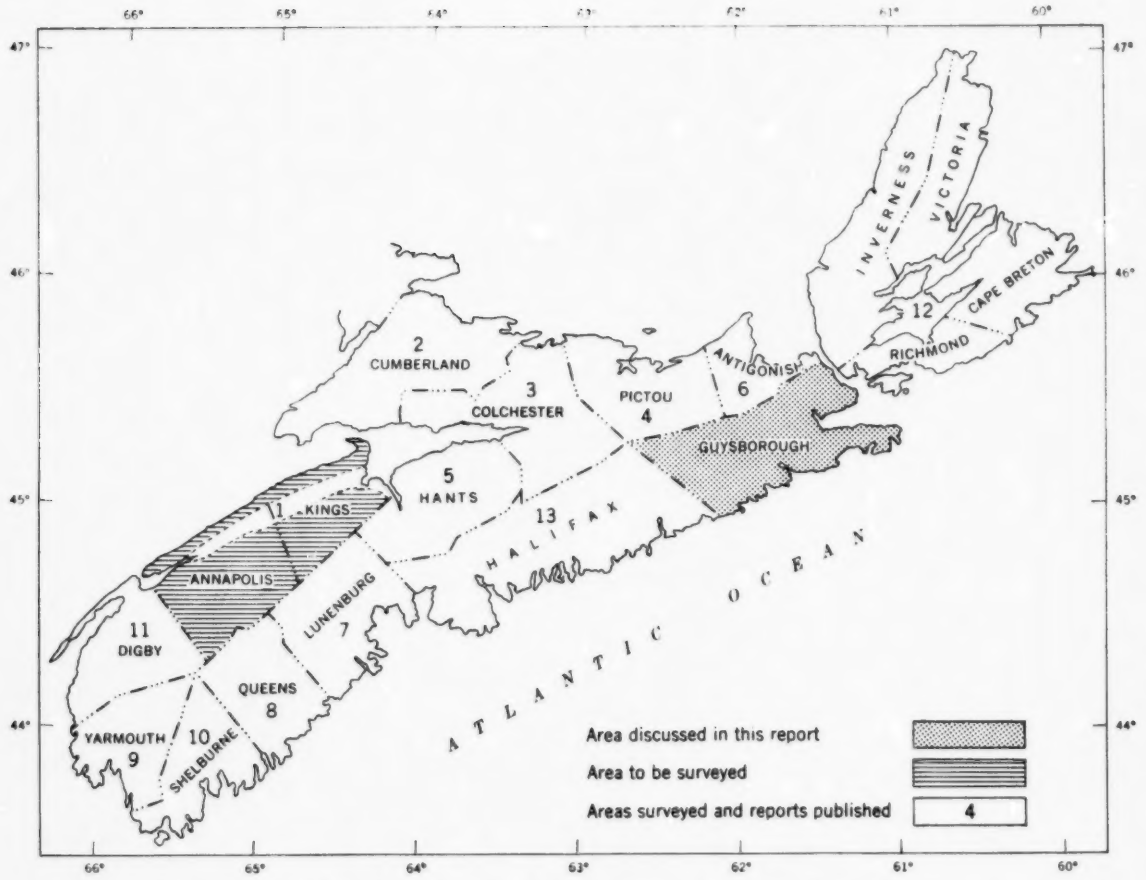

FIGURE 1.—Areas of Nova Scotia in which the soils have been surveyed.

INTRODUCTION

This report deals with the soils of Guysborough County. The first part describes some of the physical and economic factors that affect the use of the soils in the area and the factors affecting their formation. The rest of the report describes the individual soils, their use and management and their place in the agriculture of the County. A soil map accompanying the report shows the locations and distributions of the soil series. Topographic and stoniness phases within the soil series are also shown.

If you are interested in a particular piece of land, first locate the area on the soil map. The soil series have identifying names, colors and symbols that appear in the legend on the map sheet. A brief summary of useful information on individual soils appears in this legend. More details are given in the body of the report.

Readers who are interested in the broad aspects of soil conservation, wildlife conservation, highway planning, municipal development, tax assessment or land settlement will find helpful information in this report.

GENERAL DESCRIPTION OF THE AREA

Location and Extent

Guysborough County occupies the southeastern section of mainland Nova Scotia (Figure 1). It is bounded on the north by Antigonish and Pictou counties, on the west by Halifax County, on the south by the Atlantic Ocean and on the east by Chedabucto Bay and the Strait of Canso. The County lies between 44°56′ and 45°38′ north latitude and 60°55′ and 62°43′ west longitude. It has an area of 1,049,491 acres, or 1,640 square miles.

History and Development

The early history of Guysborough County concerns mainly the activities of Nicolas Denys, Captain Savalette, Jesuit missionaries and Basque fishermen. Temporary French settlements were established on the St. Mary's River and at Chedabucto about 1654. However, the earliest permanent settlement was made at Chedabucto, now Guysborough, in 1784, by British army and navy personnel. In the early years these settlers were supported by a government allowance for provisions. When this was cut off, many moved elsewhere. Those who remained developed farms in the surrounding area. The town was largely deserted and did not experience any real growth until nearly 1900, when mining and lumbering operations in the County were intensified.

In 1785 the coastal area from Crow Harbour to Guysborough Intervale was settled by, or allotted to, personnel from regiments disbanded from the American Revolutionary War. Coal Harbour, Charlos Cove and Larry's River were settled by Acadian French fishermen.

Gold mining, started in 1862, produced 14 million dollars' worth of gold from the six major mines, the largest of which was at Goldenville. Cement foundations, water-filled shafts and mine refuse dumps are now the only visible evidence of a once-thriving industry.

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Lumbering, still an important industry in the County, made comfortable fortunes for some large property owners. Unfortunately, wasteful cutting and destructive forest fires seriously depleted the forest stands. An increasing proportion of the forest is of pulpwood size or smaller.

FIGURE 2.—Population trend in Guysborough County, 1871-1961.

The population of the County reached a peak of over 18,000 in 1901, but declined to just over 13,000 by 1961 (Figure 2). Much of this decline can be attributed to the lack of job opportunities after the gold mines closed.

Population, Towns and Industries

Guysborough County had a total population of 13,274 in 1961, a drop of 528 from 1956. Canso (1,151) and Mulgrave (1,145) are the only towns in the County. Of the rural dwellers, 1,649 were classed as farm and 9,329 as non-farm residents. Many of the latter live in villages and communities such as Sherbrooke, Guysborough, Port Bickerton, Isaacs Harbour, Port Felix, Boylston, Gold River, Larry's River, Queensport and Liscomb. In many of these villages, fishing and fish-processing are the major industries. Fish-processing plants are located at Queensport, Halfway Cove, Canso and Mulgrave.

Forest products, mainly lumber and pulpwood, are important in the economy. The County produces 5 percent of the sawlog and over 4 percent of the pulpwood harvested annually in the province. The new pulp mill at Point Tupper, on the Strait of Canso, should produce a marked increase in pulpwood sales.

Mining as an industry has vanished from the County. Though some prospecting and development work are still done, there are no mines in operation now.

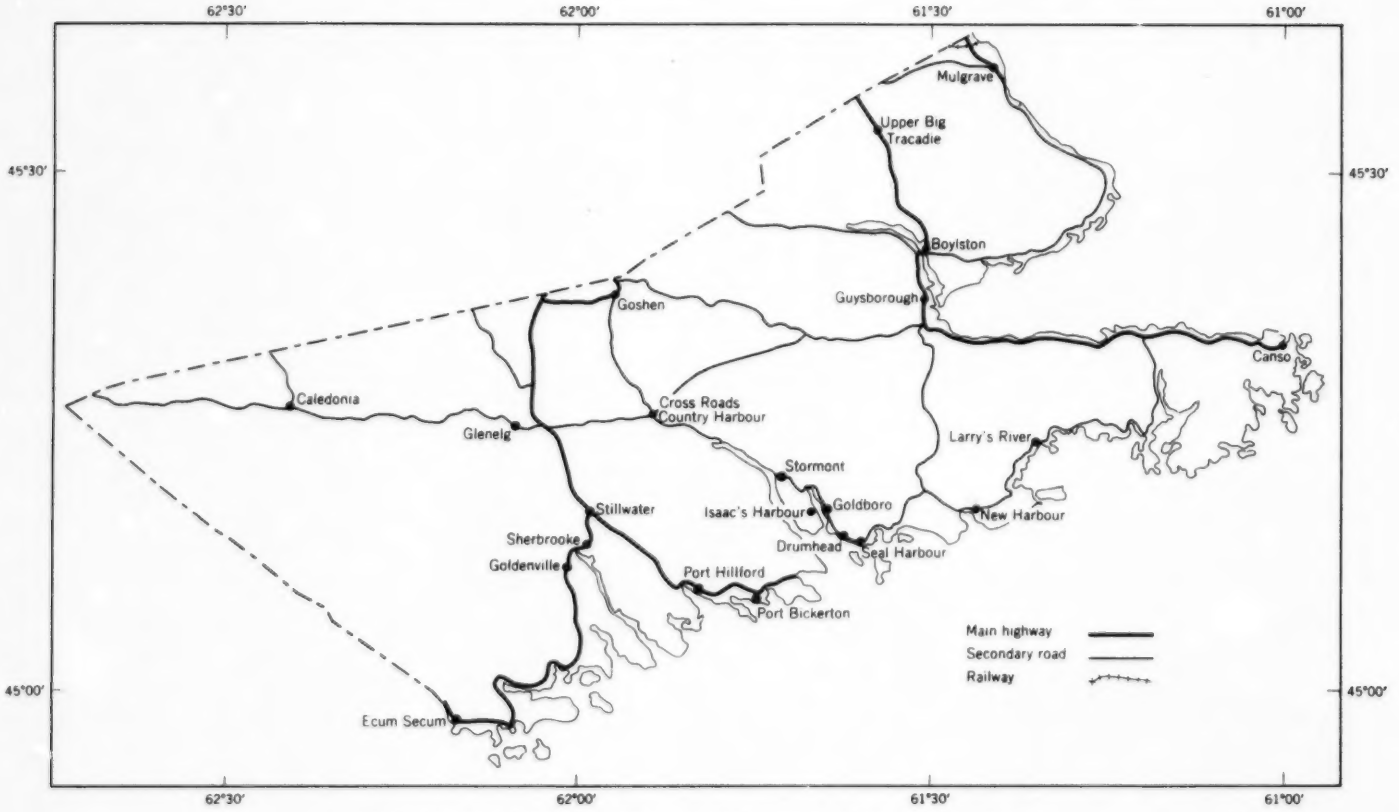

FIGURE 3.—Principal towns, villages and highways in Guysborough County.

Transportation and Markets

A paved highway, Route 16, from Canso passes through Chedabucto Bay coastal villages, Guysborough and Boylston and joins the Trans-Canada Highway at Monastery in Antigonish County (Figure 3). The "Eastern Shore" Highway, Route 7, passes through Ecum Secum, Liscomb, Goldenville, Sherbrooke and Goshen, and connects with the Trans-Canada Highway at Antigonish.

A network of secondary roads connect the smaller villages with each other and with routes 16 and 7.

A large area northwest of Liscomb and south of the West Branch St. Mary's River is practically inaccessible. Several forest trails penetrate the area from north and south, but these are not suitable for other than truck or jeep.

There are no large markets for agricultural produce in the County and the distance to provincial markets has placed agriculture at some disadvantage in comparision with most other counties of the province. However, lack of storage facilities and organized production and marketing have resulted in failure to hold even the local markets. Some of the milk produced in the north-central part of the County goes to the Antigonish and sometimes the Sydney market.

FACTORS AFFECTING SOIL FORMATION IN GUYSBOROUGH COUNTY

Soils are formed through the interaction of climate, vegetation, relief, drainage and time. Any marked change in one or more of these factors produces a different type or degree of soil development.

TABLE 1.—Average Mean Monthly and Seasonal Temperatures and Precipitation at Two Stations Representative of Guysborough County[1]

	Collegeville		Stillwater	
	Temperature °F	Precipitation Inches	Temperature °F	Precipitation Inches
December	27	4.4 (15)[2]	25	5.2 (13)
January	21	4.0 (15)	20	5.2 (13)
February	19	3.3 (16)	17	3.8 (15)
Winter	22	3.9	21	4.7
March	28	3.4 (11)	27	4.1 (10)
April	37	3.1 (4)	37	4.4 (4)
May	48	3.4	46	4.9
Spring	38	3.3	37	4.5
June	58	3.1	55	3.6
July	65	2.9	63	3.5
August	65	3.4	63	4.5
Summer	63	3.1	60	3.9
September	58	3.8	56	4.7
October	49	4.8	46	5.5
November	39	4.6 (3)	37	5.4 (3)
Autumn	49	4.4	45	5.2
Year	43	44.4	41	54.5

[1]Compiled from records of the Meteorological Branch, Air Services, Canada Department of Transport. Averages for at least 20 years in the period 1921–1950, most for 30.
[2]Snowfall (10 inches of snow = 1 inch of rain).

Climate

The climate of Guysborough County is humid temperate. Precipitation is higher in coastal areas (about 54 inches) than inland (about 44 inches) (Table 1). Average temperatures and evaporation are also lower near the coast. These variations in climate within the County are reflected in the soil development. Soils are more strongly podzolized in coastal areas than they are inland.

Long-term climatic data are available from the weather stations at Collegeville, near the Antigonish County line, and from Stillwater, just north of Sherbrooke.

According to Thornthwaite,[1] an amount of water equal to 4 inches of rainfall is regarded as the maximum storage capacity in an average soil and any rainfall over this amount is surplus. Excess water results if rainfall exceeds evapotranspiration, as is usual in fall, winter and spring in the County. A deficiency may occur in summer. Figure 4 shows that, on the average, no moisture deficiency occurs at either station during the summer. Stored moisture

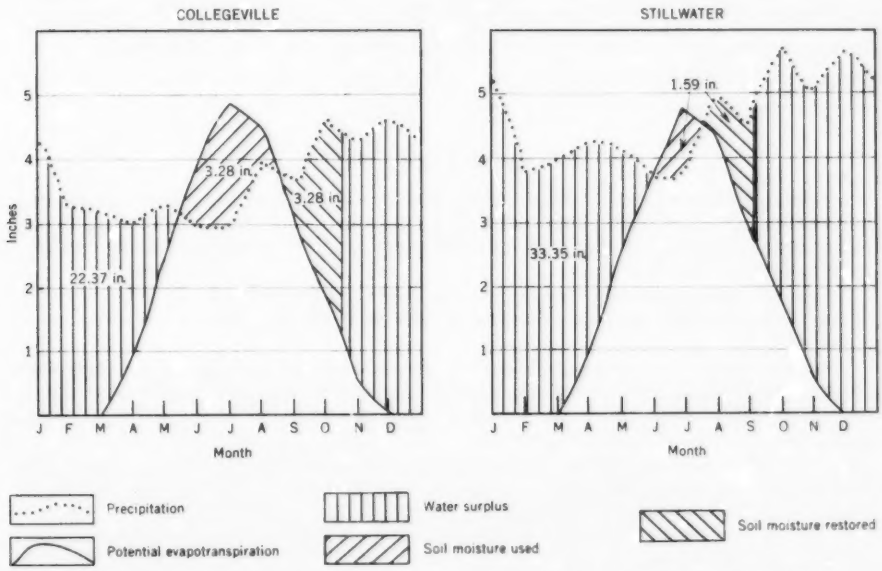

FIGURE 4.—Monthly changes in precipitation and soil moisture conditions at two stations representative of Guysborough County.

is reduced by 1.59 inches at Stillwater and by 3.28 inches at Collegeville. Deficiencies do occur at Collegeville in some years.

There is a wide range in average frost-free periods in the County. Collegeville and Stillwater have 123 and 76 days respectively (Table 2). Guysborough village has 141 days, Ecum Secum 119 and Whitehead 158 days, the longest recorded in the County.

[1] Thornthwaite, C. W. An approach toward a rational classification of climate. Geogr. Review 38:55-94. 1948.

Table 2 is useful as a guide for planting crops sensitive to frost damage, or for estimating the probability that certain crops or varieties of crops will reach maturity within the frost-free period.

TABLE 2.—Chances of Frost in Spring and Fall at Two Stations Representative of Guysborough County

Station	Average frost-free period Days	Last frost in spring		Chances of temperature of 32°F or lower on or after indicated dates in spring			
		Earliest	Latest	3 years in 4	1 in 2	1 in 4	1 in 10
Collegeville	123	April 28	July 3	May 25	June 4	June 14	June 22
Stillwater	76	June 1	July 15	June 12	June 20	June 28	July 5

Station	Average frost-free period Days	First frost in fall		Chances of temperature of 32°F on lower on or before indicated dates in fall			
		Earliest	Latest	1 year in 10	1 in 4	1 in 2	3 in 4
Collegeville	123	Aug. 31	Oct. 21	Sept. 6	Sept. 15	Sept. 25	Oct. 6
Stillwater	76	July 18	Sept. 20	Aug. 18	Aug. 27	Sept. 4	Sept. 15

Natural Vegetation

About 72 percent, or 761,000 acres, of Guysborough County is forested, 43.8 percent being coniferous, 18.7 percent mixed and only 9.6 percent deciduous forest. Much of the remaining area is peat bog, rock barren or brushland (Table 8).

Balsam fir is the main conifer (52.4 percent), with red spruce, white spruce, black spruce, white pine, hemlock and tamarack in decreasing order of gross volume.

Yellow birch, red maple, sugar maple, beech, white birch and white ash are the main deciduous trees. Scattered ironwood, red oak, white elm, black ash, trembling aspen, wire birch and other species are also present in the forest stands.

Burned areas and rocky barrens are covered with blueberry, hardhack, stunted fir and wire birch. Boggy depressions support a growth of sphagnum moss, sedges, cotton grass, stunted black spruce and tamarack.

The trees in coastal areas are mainly conifers. They are usually stunted and are of little value for forestry.

Parent Materials

About 94 percent of the soils in Guysborough County have developed from glacial till. The bulk of this material was not transported far from its point of origin. However, most of the material in the drumlins did not originate in Guysborough County.

Gravelly or cobbly, water-laid deposits of glacial origin cover 1.3 percent of the land area. They occur as eskers, kames, kame-terraces and outwash plains along existing streams, or where glacial streams once flowed.

Medium-textured alluvial deposits of more recent origin occur along many of the rivers and streams, but occupy less than 1 percent of the land area. A few areas have a coarse, cobbly texture.

Organic deposits of postglacial origin cover about 4 percent of the land area. Most of these deposits are peat, chiefly sphagnum moss, in various stages of decomposition. They are not related to the underlying mineral materials.

Soft red and gray shales of the Horton series (Figure 5) have produced the parent materials of the Woodbourne and Kirkhill soils. Altered Paleozoic rocks are the source of the moderately coarse textured, stony till of the Thom catena. A belt of gray sandstone of the Riversdale–Canso series has produced the till from which the soils of the Shulie catena have developed.

Soils of the Halifax catena have developed from moderately coarse textured, stony till derived from hard, gray, quartzitic sandstones of the Horton series.

Devonian granite and Precambrian slates and quartzites underlie the entire southern half of the County. These rocks have produced medium- to moderately coarse-textured tills on which soils of the Gibraltar, Bridgewater and Halifax catenas have developed. Quartzite and granite do not weather easily and over much of the area there is only a thin mantle of stony soil over bedrock.

Topography and Drainage

There are two major landscape areas in Guysborough County. One is the southern part of the Antigonish–Pictou highlands, whose southern extremity adjoins the valleys of the West River St. Mary's and the Salmon River. The other is the southern upland, whose northern boundary is a steep escarpment overlooking these rivers. The elevations are as great as 500 feet near the northern boundaries of both landscape areas and in the western section of the southern upland (Figure 6).

The northern area ranges from rolling to hilly. Over much of the area, drainage is well established, and most streams flow in an easterly or southerly direction. St. Mary's River and its tributaries drain the entire northwestern section, and the Country Harbour, Salmon, Guysborough, Clam Harbour and Goose Harbour Rivers drain the north-central and northwestern section of the County into Chedabucto Bay.

The narrow flood plains of the St. Mary's and Country Harbour rivers give way to deep rocky gorges as the rivers enter the southern upland and follow ancient faults in a southeasterly direction to the Atlantic.

The southern upland is an undulating plain rising gently toward the north and northwest. Though many rivers rise within the area, the drainage is complex, poorly developed and often dependent upon the strike and position of the underlying bedrock. Meandering streams, peat bogs, poorly drained areas and low rocky ridges occur throughout the area. Here the Liscomb, Ecum Secum, Indian Harbour, New Harbour, Larry's and Cole Harbour rivers originate. Nearly all flow in a southeasterly direction and several are entrenched in deep faults similar to those of the lower reaches of the St. Mary's and Country Harbour rivers. These faults, according to Goldthwait,[2] are probably the downstream remnants of channels of rivers that had their sources in New Brunswick and Quebec.

Time

The time required to develop a mature soil profile in this climate has not been established. Chemical evidence of podzolization may occur in as little as two years. However, visible signs of this soil-forming process may not become evident for a much longer period. It is assumed that, in the period since the province was last glaciated (8,000 to 10,000 years ago), the upland soils have reached a state of equilibrium with their environment.

[2] Goldthwait, J. E., Physiography of Nova Scotia. N.S. Geological Survey Memoir 140, p.44. 1924.

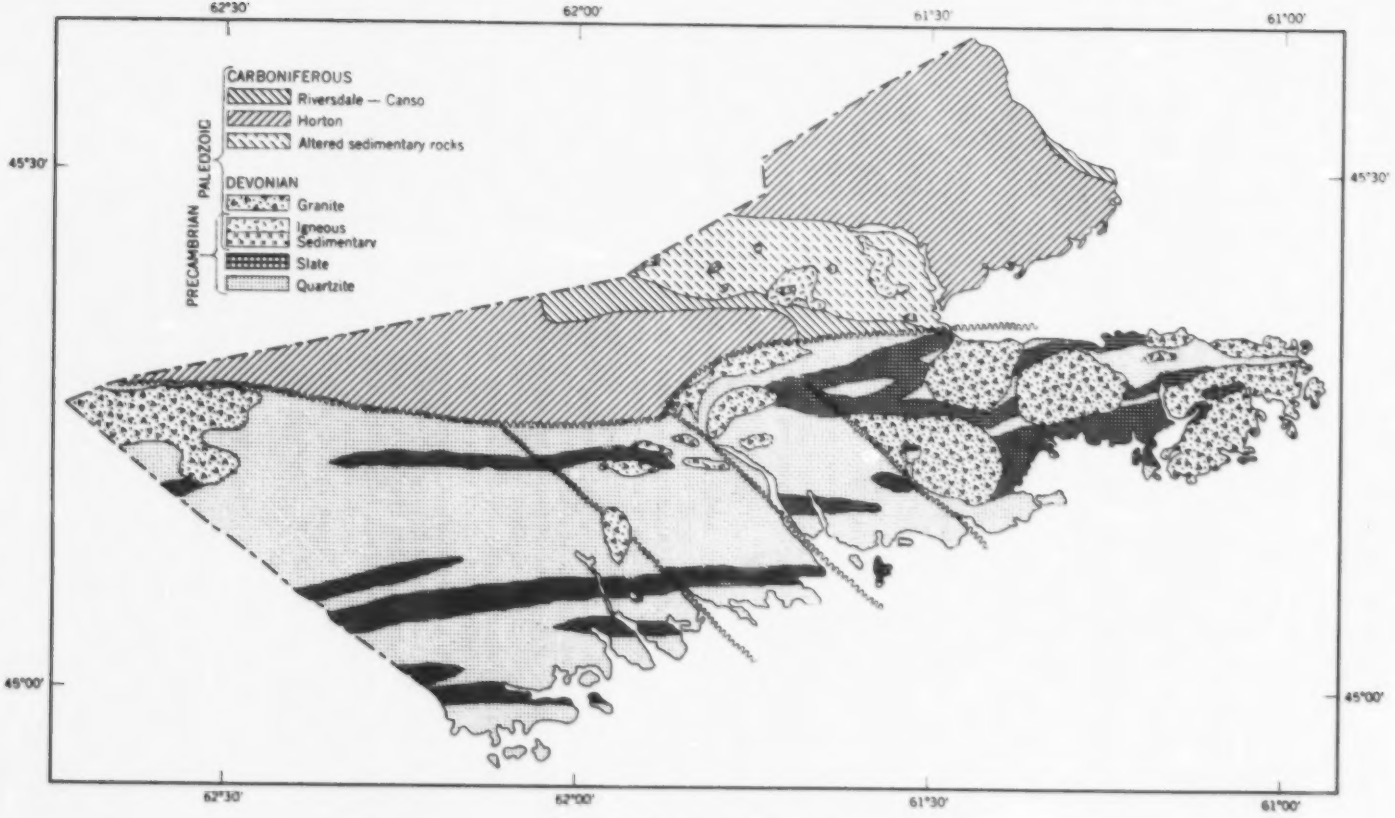

FIGURE 5.—Geological formations.

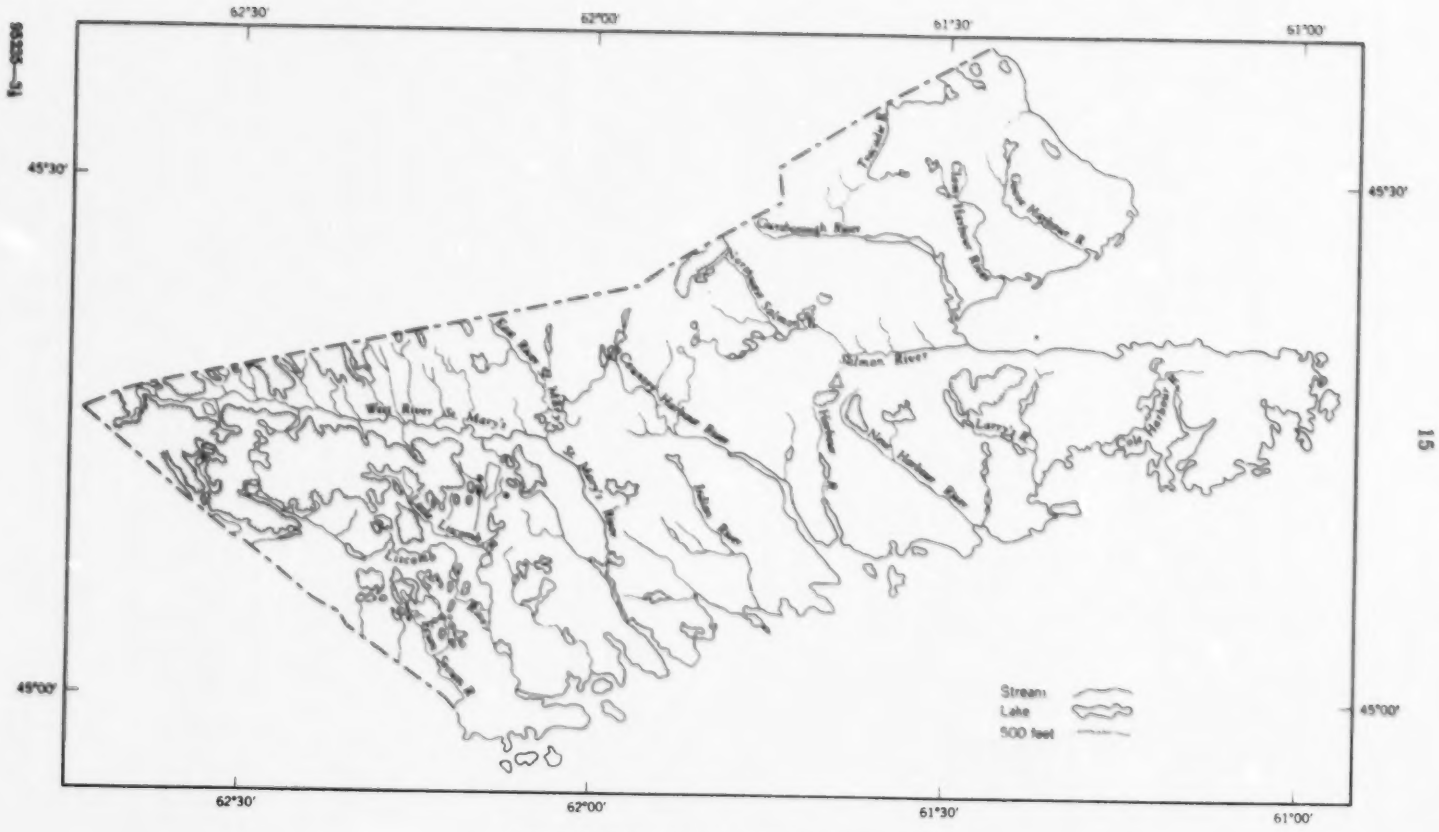

FIGURE 6.—Main heights of land and rivers.

Alluvium, coastal beach and salt marsh materials are periodically reworked by water and their periods of stability are usually too short for the soil-forming processes to produce distinct horizons.

SOIL DEVELOPMENT AND CLASSIFICATION

Soil Development

Under the influence of the various soil-forming factors, soluble salts and fine clay particles are leached downward. These are either deposited at lower depths or removed in the drainage water. This results in the formation of layers, or *horizons*, parallel to the earth's surface and differing in physical characteristics and chemical composition. A vertical section through these layers is called the *soil profile*.

The surface layer, consisting of organic material, is called the *L-H horizon*. The upper mineral part of the profile, or *A horizon*, is the layer or layers from which constituents have been removed. It is underlain by the zone of accumulation, the *B horizon*, in which materials from the *A horizon* have been deposited. The *C horizon*, underlying the B, is practically unweathered material similar to that from which the upper horizons have developed. Subdivisions may be made within each horizon according to observable differences in characteristics.

The effects of the soil-forming factors are best observed in soils that have developed on well-drained and moderately coarse textured parent materials. In such soils the surface layer (L-H horizon) consists of leaf litter and partly decomposed organic matter. This is underlain by a bleached, light-colored layer (Ae) from which bases, clay, and iron and aluminum compounds have been removed. The B horizon is dark colored and may be finer in texture than the Ae. It contains the materials leached down from the A horizon. It may be designated as Bh when humus is largely responsible for the color, as Bf when the coloring is caused largely by iron compounds, or as Bfh when both substances are responsible for the color. In some places this horizon is indurated, or cemented, and it is then designated as Bfhc. The C horizon is usually lighter in color than the B and more firm or dense.

Soils having these characteristics are known as Podzols. A profile is described in general terms as follows:

Horizon	*Description*
L-H	Black, semidecomposed organic matter; abrupt transition to Ae horizon.
Ae	Light-gray to pinkish-gray mineral soil; loose and friable.
Bfh	Dark-brown to reddish-brown mineral soil becoming lighter in color with depth; usually finer textured than Ae.
Bf	Yellowish-brown to light reddish brown mineral soil.
C	Unweathered parent material; various textures, colors and consistencies.

In another group of soils in the County, development has been restricted by poor drainage and lack of aeration. These soils are usually found at the bases of slopes, on low-lying areas, or on generally level land where a compact subsoil restricts the movement of water. These soils differ from well-drained Podzol soils mainly as follows: The L-H horizon is usually thicker. The Ae and B horizons are mottled with gray and yellowish-brown colors due to reduction of iron compounds in the presence of organic matter. This reduction process is known as *gleying*. Gleyed horizons are indicated by attaching a suffix, *g*, to the

main horizon designation. These soils belong to a group known as Gleysols, of which a profile is described in general as follows:

Horizon	*Description*
L-H	Black, semidecomposed organic matter; often mucky in appearance.
Aeg	Dark-gray to dark reddish gray mineral soil; mottled with light and dark patches or splotches.
Bg	Light-brown to light reddish brown mineral soil; strongly mottled with gray or strong-brown colors; usually less strongly mottled with depth.
C	Unweathered parent material; usually firm to impervious; moderately to weakly mottled.

In the very poorly drained sites, the mottling colors may be much subdued and the lower horizons may be dull gray.

Another group of soils found in the County are the organic deposits. These occur in depressional areas and are saturated with water most of the year. They do not have the well-developed horizons of the mineral soils, but rather successive layers of organic material, chiefly moss and sedges, in various stages of decomposition. These soils are classed as *peat*.

Sediments have been deposited as flood plains along streams throughout the area. These materials have not had enough time to develop distinct horizons. They are immature soils, or Regosols.

Soil Survey Methods

The general characteristics of the County soils were studied first. This information guided soil description and mapping in the detailed reconnaissance survey that followed.

All roads and accessible trails in the area were used in the survey. Exposures were studied along the highways and in pits dug in cultivated fields and in forested areas. Notes on natural vegetation, soils, crops and possible land uses were recorded in detail. In cleared areas it was possible to check and map the soil boundaries accurately. Elsewhere, boundaries were defined from aerial photographs and field observations made at widely separated intervals. The information was plotted on base maps at a scale of 1.267 inches to one mile (1:50000).

When mapping was completed, the principal soil series were sampled at each horizon, including the parent material, for chemical and physical analyses. These are given in the tables at the end of this report.

Units of Classification

The basic mapping unit used in the County was the soil series. A *series* is a group of soils developed from the same kind of parent material under the same drainage conditions and having the same kind of profile except for the texture of the surface soil. *Soil types*, or subdivisions of the soil series based on surface texture, are not shown on the soil map. However, the main soil types are indicated in the text of the report.

The soil series mapped in Guysborough County are arranged in Table 3 to show their principal relationships. Major differences between the soils are associated with differences in the texture and composition of the parent material. The soils in each horizontal row of Table 3 have developed from the same kind of parent material but differ in drainage as indicated by the vertical columns. Such a grouping is called a *catena*. Poorly drained members of the catenas are listed in the Gleysolic order.

Acreages of the various soil series mapped in the County are given in Table 4.

TABLE 3.—Classification of the Soils

Parent material	Rapidly drained	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Humic Podzols					
Grayish-brown gravelly sandy loam till		*Orthic Humic Podzol* Thom		*Gleyed Humic Podzol* Mira	
Podzols					
Reddish-brown sandy clay loam till		*Orthic Podzols*		*Gleyed Podzols*	
Dark reddish brown gravelly clay loam till			Wolfville		
Dark grayish brown to olive loam till			Woodbourne		
Olive-gray to olive-brown loam till		Kirkhill		Millbrook	
Dark reddish brown gravelly, sandy loam till		Bridgewater		Riverport	
Grayish-brown sandy loam till		Westbrook			
Grayish-brown to olive stony, sandy loam till		Shulie		Springhill	
Pale-brown gravelly, sandy loam till		Halifax		Dancsville	
Dark grayish brown gravelly outwash		Gibraltar		Bayswater	
Brown to olive shaly outwash	Hebert Torbrook				
		Ortstein Podzol		*Gleyed Textural Podzol*	
Yellowish-brown coarse sand and gravel outwash	Nictaux				
Dark reddish brown gravelly clay loam till					Kingsville
Regosols					
Reddish-brown to brown sandy loam alluvium		*Orthic Regosol* Cumberland		*Gleyed Regosol* Bridgeville	
Humic Gleysols					
Grayish-brown sandy loam to loam alluvium				*Rego Humic Gleysol* Chaswood	
Gleysols					
Brownish-gray to pale-olive sandy loam till				*Orthic Gleysols*	
					Middlewood
					Aspotogan
Organic Soils					
Deposits of semidecomposed organic materials					Peat

DESCRIPTIONS OF THE SOILS

Soils developed from glacial till, including rock land, occupy 90 percent of the County, outwash materials 1 percent, alluvial materials 0.6 percent, and peat 3.4 percent. The remaining 5.0 percent is occupied by water, small areas of coastal beach and salt marsh.

About 55 percent of the area, excluding rock land, has well-drained or moderately well drained soils. Most, excepting only the alluvial soils (0.6 percent), are classed as Orthic and Ortstein Podzols. Another 21 percent are imperfectly drained and are classed as Gleyed Podzols. They are imperfectly drained Podzols that have mottling in the profile. Strongly mottled or gleyed soils (4.2 percent) are classed as Gleysols.

TABLE 4.—Acreages of the Soils, and Percentages of the Total Area

Soil series or land type	Acres	Percent of total area
Woodbourne	538	.1
Wolfville	25,559	2.4
Westbrook	1,758	.2
Kirkhill	54,016	5.1
Bridgewater	11,873	1.1
Thom	54,123	5.2
Shulie	46,459	4.4
Halifax	306,504	29.2
Gibraltar	58,284	5.6
Hebert	7,784	.7
Torbrook	1,774	.2
Nictaux	2,304	.2
Cumberland	5,344	.5
Millbrook	75,801	7.2
Riverport	66,817	6.4
Springhill	10,657	1.0
Mira	1,495	.1
Danesville	63,609	6.0
Bayswater	6,154	.7
Bridgeville	391	.0
Kingsville	605	.1
Middlewood	5,014	.4
Aspotogan	38,588	3.7
Chaswood	853	.1
Rock	115,198	11.0
Peat	35,591	3.4
Salt marsh	84	.0
Coastal beach	1,255	.1
Inland water	51,059	4.9
Total	1,049,491	100.0

In the following soil descriptions, soil colors are described by names and symbols of the Munsell color system.[3] 10YR 4/3 is the symbol for a particular shade of dark brown; 5YR 4/3 is a shade of reddish brown and so on. The colors are for moist soils. Terms such as structure and consistence are defined in the glossary.

Soils Developed from Moderately Fine Textured Glacial Till

Soils of the Wolfville and Woodbourne catenas make up this group. They occupy 102,504 acres, or 9.8 percent of the County.

Soils of the Wolfville catena (Wolfville series) have developed on sandy clay loam and gravelly clay loam drumlinoid deposits of glacial till. Soils of

[3] Munsell soil color charts. Munsell Color Company Inc., Baltimore 2, Maryland, U.S.A. 1954.

the Woodbourne catena (Woodbourne, Millbrook and Kingsville series) have developed from material of similar texture derived from reddish-brown Carboniferous shale and sandstone.

Wolfville Series (25,559 acres)

The soils of this series are found on drumlins scattered over the southern half of the County from Halifax County to Cape Canso. They are well drained to moderately well drained and have gently to steeply sloping topography. Drainage is rapid on the surface, but is restricted by the compact, slowly pervious subsoil. Most of the drainage water moves with the slope over this compact substratum.

Wolfville soils in the western half of the County are mostly covered with red maple, yellow birch and beech. Coniferous stands contain red and white spruce, balsam fir, hemlock and a few pine.

The profile of a soil under forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Sphagnum moss underlain by a thin, black, fairly well decomposed, greasy mor.
Ae	0-2	Dark grayish brown (10YR 5/2) sandy loam; medium crumb structure; friable; porous; pH 3.7.
Bfh1	2-8	Dark-brown (7.5YR 4/2) loam; granular structure; moderately friable; slightly mottled; porous; pH 4.8.
Bfh2	8-16	Dark grayish brown (10YR 4/2) sandy clay loam; granular structure; moderately friable; slightly mottled; slightly firm; pH 5.0.
BC	16-21	Reddish-brown (5YR 4/3) sandy clay loam; massive, slightly mottled; firm; pH 5.0.
C	21+	Dark reddish brown (5YR 3/3) sandy clay loam; firm; slightly mottled; pH 5.2.

The cultivated (Ap) horizon is dark reddish brown (5YR 3/3) loam. On the steeper slopes the profiles are usually shallow and the layers may be indistinct. Gravelly surfaces may occur where coarser tills have been locally superimposed over the finer-textured till. These areas usually occur on the lower slopes of the drumlins and are often very stony.

Use

Only 3,930 acres, or 15 percent, of the Wolfville soils are sufficiently free of stone to be suitable for agriculture. On the remaining areas, surface stones could be removed and the land used for farming should the need arise. For the present, such areas should remain in forest.

When cleared and properly managed the Wolfville soils are suitable for growing vegetables, small fruits and forage crops. Erosion may be a problem and steeper slopes should be kept in pasture, forage crops or forest. Gentler slopes can be used for clean-cultivated crops.

Woodbourne Series (538 acres)

Woodbourne soils occupy a small area in the north-central part of the County and are associated with the imperfectly drained Millbrook and poorly drained Kingsville series. They have developed on glacial till derived from carboniferous red sandstones and shales containing appreciable amounts of Calcareous cementing material. Forest growth is rapid on the Woodbourne soils. They usually support excellent stands of conifers, chiefly red spruce,

white spruce, fir and hemlock. Yellow birch and maple are the most common deciduous trees.

The profile of a soil under forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Dark-brown, semidecomposed organic matter; fibrous; pH 4.7.
Ae	0-5	Weak-red (2.5YR 4/2) gravelly clay loam; medium platy structure; friable; pH 4.3.
Bf	5-12	Dark reddish brown (2.5YR 3/4) loam; medium, subangular blocky structure; slightly firm; pH 4.6.
BC	12-20	Dusky-red (2.5YR 3/2) gravelly clay loam; medium, subangular blocky structure; slightly firm; angular sandstone fragments and flagstones; pH 5.0.
C	20+	Dusky-red (10R 3/2) gravelly loam till; structureless; moderately firm; fragments of red shale and sandstone; pH 5.3.

Where the till is deep, finer textures occur and usually the C horizon is gravelly clay loam to sandy clay loam. Surface textures are usually loam, but may range from sandy loam to clay loam. Flaggy brown and gray sandstone is present in most areas both on the surface and throughout the profile. This can be a serious hindrance to clearing and cultivation. Rock outcrops and shallow areas occur.

Use

Only a small area of the Woodbourne series occurs in the County. The soils can be used for a wide range of crops. They are subject to erosion under clean cultivation, but when well managed they are suitable for intertilled crops grown in rotation.

Millbrook Series (75,801 acres)

Millbrook soils occur on gently undulating to rolling topography and are associated with the Woodbourne and Kingsville soils. Drainage is fairly rapid in the surface layer but is slow in the subsoil and seepage spots are common on long slopes. Most of these soils are forested, fir, red spruce and white spruce being the most common species. Red maple and yellow birch are the most common deciduous trees. Except for a few areas of steep and stony phases, Millbrook soils are suitable for agriculture.

The profile of a soil under forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Black greasy mor; pH 3.6.
Ae	0-3	Reddish-gray (5YR 5/2) silt loam; structureless; moderately friable; pH 3.9.
Bfhgj	3-12	Dark reddish brown (5YR 3/4) gravelly silt loam; coarse crumb structure; moderately friable; mottled with gray streaks; pH 4.8.
BCgj	12-20	Reddish-brown (5YR 4/3) loam; blocky structure; firm; mottled; pH 5.0.
C	20+	Reddish-brown (5YR 4/3) gravelly clay loam; massive; compact and slowly pervious; pH 5.0.

Mottled discolorations occur around embedded stones and as streaks in the B horizon. Clay flows are found to a considerable depth in the till. The cultivated (Ap) layer is very dark grayish brown (10YR 3/2) sandy loam to clay loam, but is usually loam. Under grass the Ap horizon develops a strong granular

structure and is friable and easy to work (Figure 7). Clean cultivation rapidly destroys this condition, however, and once organic matter is depleted the soil becomes refractory and unresponsive.

Use

Millbrook soils produce a wide range of crops, from potatoes and vegetables to forage crops. They are best suited to forage crops, particularly hay and pasture. About 70,800 acres could be used for agriculture. At present, most of these soils are in productive forest.

FIGURE 7.—Profile of a Millbrook soil. A compact, almost impervious subsoil underlies the friable surface and upper B horizon.

KINGSVILLE SERIES (605 acres)

Kingsville soils occupy small, nearly level to depressional areas in association with the Millbrook and Woodbourne series. Their total area in the County is small and they have little agricultural importance. The profile of a soil forested with black spruce, red maple and tamarack is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	6-0	Black greasy mor overlain by several inches of raw sphagnum moss.

Aeg	0-5	Gray (5Y 6/1) silt loam; firm; stony; pH 4.2.
Bfg	5-15	Grayish-brown (10YR 5/2) loam; reddish-brown mottles; structureless; firm; pH 4.7.
Cg	15+	Reddish-brown (5YR 4/3) sandy clay loam; compact; strongly mottled; pH 5.0.

In the level or depressed areas in which the Kingsville series is usually found, bedrock near the surface further restricts vertical movement of water, already slowed by the compact, plastic subsoil.

Use

These soils are best suited to forest. A few small areas could be drained and used for pasture and forage crops.

Soils Developed from Medium- and Moderately Coarse-textured Glacial Tills

Soils of this group occupy 725,351 acres, or 69 percent of the County. The well-drained series are Kirkhill, Bridgewater, Halifax, Thom, Westbrook, Shulie and Gibraltar. The imperfectly drained series are Riverport, Danesville, Mira, Springhill and Bayswater. Only two series are poorly drained, Middlewood and Aspotogan.

The Bridgewater, Kirkhill, Riverport and Middlewood soils have developed from shaly loam and shaly sandy loam tills derived from shale and slate. Halifax and Danesville soils have developed from sandy loam quartzitic till. Some slate and granite material may be present. Thom and Mira soils have developed on gravelly loam till derived principally from igneous and metamorphic rocks, Westbrook on gravelly sandy loam and gravelly loam till derived from conglomerate, Shulie and Springhill on sandy loam till derived from gray sandstone, Gibraltar and Bayswater from gravelly sandy loam granitic till and Aspotogan from granite or quartzitic materials.

Kirkhill Series (54,016 acres)

These soils occupy undulating to strongly rolling areas in the northern half of the County. Scattered farms are found on them near South Lochaber, South River Lake, Erinville, North Riverside, Ogden and Middle Manchester. About 39,000 acres have been classed as potentially suitable for agriculture.

Most areas are forested, with fir, red spruce, white spruce, maple and yellow birch.

A typical profile is described as follows

Horizon	*Depth Inches*	*Description*
L-H	2-0	Very dark brown (10YR 2/2) semidecomposed organic matter; F layer fibrous; H layer greasy mor; pH 3.6.
Ae	0-2	Gray (10YR 5/1) gravelly sandy loam; weak, coarse crumb structure; friable; pH 3.8.
Bfh1	2-6	Brown (7.5YR 4/4) loam; well-developed medium crumb structure; friable; pH 4.7.
Bfh2	6-14	Dark yellowish brown (10YR 4/4) sandy loam; fine crumb structure; friable; pH 4.8.
BC	14-20	Dark grayish brown (10YR 4/2) sandy loam; structureless; porous; gritty; pH 4.8.
C	20+	Dark grayish brown (10YR 4/2) shaly sandy loam; slightly firm; porous; numerous shale fragments; pH 5.0.

The cultivated (Ap) layer is a dark grayish brown (10YR 4/2) loam to shaly loam with a weak granular structure. It is slightly sticky when wet and unless limed has a pH about 5.0.

Use

Only a small percentage of the Kirkhill soils are cultivated. Unfavourable slopes, shallowness and stoniness make them unattractive for farming. Many areas were farmed at one time but have since been abandoned. This trend is continuing. The soils are acid and unproductive, but respond to lime and fertilizer. When poorly managed their fertility is quickly depleted.

Much of the abandoned cleared land could be developed for growing lowbush blueberries. Areas now in forest should remain so, at least until those areas now cleared are used to better advantage.

These soils are subject to severe erosion, and should not be cultivated on the steeper slopes. Where they are suitable for cultivation, any crop adapted to the climate will grow on them. They have a wider adaptation than the Millbrook soils.

Bridgewater Series (11,873 acres)

The Bridgewater soils are found on gently undulating to hilly topography in association with Riverport and Middlewood series. They are well drained and have developed on glacial till derived principally from slate. Most of the soils are in the southeast section of the County at Queensport, Halfway Cove, Dorts Cove and Lundy. Small areas occur at Liscomb, Ecum Secum, Upper New Harbour, Torbay and elsewhere.

The profile of a soil under spruce, fir, hemlock and beech is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Black felty layer over thin greasy mor; pH. 3.8.
Ae	0-2	Light brownish gray (2.5Y 6/2) loam; medium crumb structure; very friable; pH 3.9.
Bfh1	2-9	Brown (7.5YR 5/4) shaly silt loam; medium crumb structure; very friable; porous; pH 4.9.
Bfh2	9-17	Dark yellowish brown (10YR 4/4) shaly silt loam; fine crumb structure; moderately friable; pH 5.1.
C	17+	Light olive brown (2.5Y 5/4) shaly sandy loam; moderately firm; porous; pH 5.1.

The Ae horizon is patchy and is seldom more than two or three inches thick. The B ranges from brown to yellowish red and may contain some streaks of dark reddish brown (5YR 3/2). In places the B rests on bedrock.

Use

Only 13 percent of the Bridgewater soils in Guysborough County are suitable for general crops. Stoniness and shallowness are the principal factors limiting their use. Where stone is not a serious problem and depth is adequate, a wide range of crops can be grown. The low pH and high free-iron content in these soils make them especially well suited to growing lowbush blueberries. They are excellent forest soils supporting better stands of timber than the adjacent Halifax or Gibraltar soils. The finer-textured Bridgewater soils retain moisture well and are not subject to severe fire damage. When areas do burn, natural reforestation takes place rapidly.

HALIFAX SERIES (306,504 acres)

Soils of this series occupy 29.2 percent of the County. They are found on gently undulating to hilly topography and are associated with the Danesville and Aspotogan series. The soils are well drained and support fair to good stands of mixed forest. Common tree species are red spruce, white spruce, fir, maple, birch and pine.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Very dark brown (10YR 2/2), semidecomposed granular mor; pH 3.8.
Ae	0-2	Light-gray (10YR 7/2) sandy loam; structureless; porous; gritty; pH 3.6.
Bfh1	2-4	Reddish-brown (5YR 4/4) sandy loam; fine crumb structure; friable; numerous roots; pH 4.4.
Bfh2	4-14	Strong-brown (7.5YR 5/8) sandy loam; fine crumb structure; friable; pH 4.8.
BC	14-24	Yellowish-brown (10YR 5/4) sandy loam; weak, subangular blocky structure; slightly firm; pH 4.9.
C	24+	Brown (10YR 5/3) gravelly sandy loam; firm; porous; pH 5.0.

The Halifax soils are practically uniform over the entire inland area. Toward the coast, organic matter increases in the upper B, giving this horizon a darker color. The parent material ranges from brown to olive. Textures are also nearly uniform throughout. A few areas are underlain at some depth by smears of fine-textured reddish-brown till related to the Wolfville parent material. These smears are discontinuous, patchy and at sufficient depth to have had little or no effect on profile textures or development.

Use

Only 1,383 acres, or 0.4 percent, of the Halifax soils in Guysborough County are sufficiently free of stone to be suitable for cultivation. The areas in the coastal communities of Ecum Secum, Fishermans Harbour and Indian Harbour are used for vegetables, forage crops and pasture.

Large areas of these soils are barren or semibarren because of fires in past years. Open, moderately coarse textured soils like these are not readily reforested after burning and often regenerate to laurel and heath vegetation. Sound woodlot management with selective cutting would in time produce greatly increased returns from the forest resources on these and similar soils of the County.

THOM SERIES (54,123 acres)

Thom soils have developed on rolling to hilly topography from glacial till derived chiefly from hard metamorphic and igneous rocks. They are well drained and are associated on the landscape with the imperfectly drained Mira series.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Black granular mor; pH 3.4.
Ae	0-3	Grayish-brown (10YR 5/2) sandy loam; very friable; medium crumb structure; pH 3.4.
Bfh1	3-14	Dark reddish brown (5YR 3/4) sandy loam; very friable; medium crumb structure; pH 4.2.
Bfh2	14-30	Dark reddish brown (5YR 3/2) gravelly sandy loam; moderately friable; structureless, pH 4.7.
C	30+	Dark-brown (7.5YR 3/2) gravelly sandy loam; firm porous; pH 5.0.

The parent material ranges from olive brown (2.5Y 4/4) to dark brown (7.5YR 3/2) but normally is dark grayish brown (10YR 4/2).

Use

Thom soils occupy 5.2 percent of the County. Only 5,171 acres, or 9.5 percent of this area, is classed as arable. This small acreage is limited in used by topography, stoniness and shallowness. Large areas, once cleared and farmed, have reverted or are reverting to forest. Stone piles, stone fences and building foundations are all that mark the locations of once thriving farmsteads and communities.

Westbrook Series (1,758 acres)

Westbrook soils occur on undulating to rolling topography in the area south of Guysborough town and near Cameron Settlement. They have developed from reddish-brown sandy loam glacial till derived principally from conglomerate. Though occupying a very small area they are all suitable for agricultural development. Much of the total area is forested with spruce, fir, pine, maple and tamarack.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Dark reddish brown (2.5YR 2/4), semidecomposed organic matter; F layer felty; H layer thin, greasy mor; pH 3.8.
Ae	0-3	Weak-red (2.5YR 4/2) sandy loam; weak, subangular blocky structure; friable, pH 3.8.
Bfh1	3-8	Dark reddish brown (2.5YR 3/4) sandy loam; medium crumb structure; friable; pH 4.6.
Bfh2	8-18	Reddish-brown (5YR 4/3) sandy loam; weak crumb structure; friable; pH 4.9.
C	18+	Dark reddish brown (2.5YR 3/4) gravelly sandy loam; firm; porous; pH 5.0.

Use

Practically all of the Westbrook soils in the County are arable, but only a few acres are used. Stone on the surface is not sufficient to prevent clearing and farming. The soils are suited to growing vegetables, small fruits, tree fruits and forage crops. Both conifers and hardwoods grow well on the Westbrook soils in this area.

Shulie Series (46,459 acres)

Shulie soils are well drained. They have developed on an undulating to rolling topography and are associated with the imperfectly drained Springhill soils. Both series have developed on glacial till derived from gray and brown sandstone or quartzose-sandstone of Carboniferous age.

In Guysborough County, Shulie soils support good stands of spruce, fir, hemlock, birch and beech.

The profile of a soil under mixed forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Very dark brown (10YR 2/2), semidecomposed organic matter; pH 3.5.
Ae	0-2	Grayish-brown (10YR 5/2) silt loam; weak, medium crumb structure; friable; pH 3.9.
Bfh1	2-7	Yellowish-brown (10YR 5/8) gravelly silt loam; fine crumb structure; friable; pH 4.7.

Bfh2	7-17	Dark yellowish brown (10YR 4/4) gravelly silt loam; weak crumb structure; moderately friable; pH 4.9.
C	17+	Olive-brown (2.5Y 4/4) gravelly loam; firm; porous; numerous sandstone fragments; pH 5.2.

The cultivated (Ap) horizon is dark grayish brown (10YR 4/2) sandy loam to loam and has a weak granular structure. The B horizon is usually friable and ranges from 12 to 20 inches in thickness. The lower B may be compacted enough to impede drainage.

Use:

About 17,000 acres, or 37 percent, of the Shulie soils are suitable for cultivation. The farms on them are small and many have been abandoned. The chief deterrents to increased use are stoniness and location. Cleared areas that are not farmed at present should be either incorporated into larger, more economic farm units or allowed to revert to forest. Though suitable for growing a variety of crops, the Shulie soils in Guysborough County are in areas of high frost hazard. Climate rather than the soil limits the range of crops that can be grown.

Gibraltar Series (58,284 acres)

Gibraltar soils are found from Yarmouth to Canso. In Guysborough County they are confined almost entirely to those areas underlain by granite. They are well drained and occur on undulating to rolling topography, in association with the Bayswater and Aspotagan series, which occupy the more level or depressional areas.

Large areas of the Gibraltar soils are treeless. Forested areas support fairly good mixed stands of white and red spruce, fir, pine, hemlock, wire birch, yellow birch, maple and beech. Semi-permanent fire-barrens are covered with a dense growth of lambkill, labrador tea, huckleberry and blueberry.

The profile of a soil under undisturbed forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Black, loose, granular mor; pH 3.8.
Ae	0-2	Grayish-brown (10YR 5/2) sandy loam; medium granular structure; very friable; pH 4.2.
Bfh1	2-9	Brown (7.5YR 4/4) sandy loam; fine crumb structure; very friable; pH 4.3.
Bfh2	9-17	Dark yellowish brown (10YR 4/4) gravelly sandy loam; weak granular structure; slightly firm; friable; pH 4.8.
C	17+	Pale-brown (10YR 6/3) gravelly sandy loam; moderately firm; moderately friable; pH 4.8.

In some areas the Bfh horizon is cemented, and weakly cemented Bf and BC horizons may extend to a depth of 30 inches or more. The lower B horizon is sometimes faintly mottled.

Use

Probably no soil in the province is less suited for cultivation than the Gibraltar series. In Guysborough County only 76 acres are classed as suitable for this purpose. Large boulders on the surface preclude use of these soils for other than forestry, recreation and wildlife. The rough, boulder-strewn terrain makes logging operations difficult and costly. Large tracts are left for years and then ruthlessly culled. The resulting slash, the deep layer of exposed mor, and the open, droughty mineral soil combine to make newly logged areas extremely vulnerable to fire. When these do occur, they usually burn so deep that forest

regeneration is very slow. Some fire-barrens on these soils have persisted for a hundred years and are destined to persist for many years. The vigorous growth of hardhack, which usually develops on the barrens, further retards the natural reestablishment of forest cover.

Riverport Series (66,817 acres)

The Riverport soils are imperfectly drained. They are associated with the well-drained Bridgewater and Kirkhill series and the poorly drained Middlewood series. They have developed on glacial till derived principally from slate or shale and occupy nearly level to gently undulating topography. Natural drainage is slow in very large areas because of extreme shallowness over bedrock. Fir, spruce, tamarack and red maple are the dominant tree species, with conifers most prominent. A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	5-0	Black greasy mor, underlying a layer of sphagnum moss; pH 3.6.
Ae	0-2	Dark grayish brown (10YR 4/2) loam; slightly plastic; structureless; pH 3.6.
Bfhgj1	2-8	Brown (10YR 5/3) loam; moderately friable; structureless; yellowish-brown (10YR 5/4) mottles; pH 4.5.
Bfhgj2	8-13	Grayish-brown (2.5Y 5/2) shaly loam; slightly firm; structureless; grayish-brown mottles; pH 4.8.
Cgj	13+	Grayish-brown (2.5Y 5/2) shaly loam; moderately firm; reddish-brown mottles; pH 5.0.

Complex drainage patterns, due to the topography and strike of the bedrock, produce marked changes in profile characteristics over short distances. Small areas of Bridgewater and Middlewood soils were included with the Riverport series.

Figure 8.—Lowbush blueberries on a boulder-strewn area of the Riverport series.

Use

About 13 percent of the Riverport series is suitable for agricultural use. Only small areas are cultivated or pastured. Where the till is deep these soils

are used in much the same way as Bridgewater soils, with some additional attention to drainage. One area of the Riverport series, east of Larry River, has been developed for growing lowbush blueberries (Figure 8). This area is unusually stony. Riverport soils produce good forest growth and trees are the most suitable crop for most areas.

Danesville Series (63,609 acres)

Danesville soils are found throughout the southern upland, in association with the Halifax and Aspotogan series. They occur on gently undulating to gently rolling topography where the strike of the underlying rock prevents free movement of water. In a few areas the till is compact enough to impede the downward movement of water. These soils support fair forest growth, mostly red spruce, black spruce, tamarack and fir. In coastal areas the growth is very stunted. This has been attributed to winds and salt spray from the Atlantic.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	5-0	Black greasy mor, underlying a thin layer of sphagnum moss; pH 3.9.
Ae	0-3	Light-gray (5Y 6/1) sandy loam; structureless; friable; pH 4.3.
Bfhgj1	3-5	Dark reddish brown (5YR 3/2) gravelly sandy loam; coarse granular structure; mottled; pH 4.6.
Bfhgj2	5-12	Brown (7.5YR 4/4) gravelly sandy loam; weak granular structure; moderately friable; mottled; pH 4.9.
Bfgj	12-20	Strong-brown (10YR 5/6) gravelly sandy loam; firm, moderately friable; grayish-brown mottles; pH 5.0.
C	20+	Grayish-brown (2.5Y 5/2) gravelly sandy loam; moderately firm; pH 5.2.

The Ae horizon in the series ranges from two to eight inches thick. Commonly, the upper B horizon has a firm consistence, but crumbles readily to shotlike peds or breaks into platy fragments.

The water table rises to within 20 inches of the surface for much of the year.

Use

Only 287 acres of the Danesville soils are classed as arable. Most areas are unsuitable for farming.

The value of Danesville soil for forestry depends on distance from the coast. Forest growth is poor in coastal areas, but improves markedly from one half to two miles inland. The trees are mostly black spruce, red spruce and tamarack. Growth is less vigorous than on Halifax soils and large areas are too shallow to support large trees.

Mira Series (1,495 acres)

The Mira soils occur on gently undulating topography and are associated with the Thom soils, which they resemble in many respects. They differ mainly in having developed under imperfect drainage. Bedrock near the surface traps water in shallow basins or allows it to move along the surface and appear as seepage spots on slopes. Many areas of the Mira series were included with the Thom series because of their small size.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Very dark gray (10YR 3/1) greasy mor; pH 4.2.
Aegj	0-2	Pinkish-gray (7.5YR 6/2) sandy loam; structureless; strong-brown mottles; pH 5.0.
Bfhgj	2-15	Brown (10YR 4/3) sandy loam; weak crumb structure; grayish-brown mottles; pH 5.0.
Cgj	15+	Pale-brown (10YR 6/3) gravelly sandy loam; firm; dark-brown patches; pH 5.4.

Use

Stoniness and shallowness have limited the agricultural use of Mira soils to small areas in pasture or wet spots in otherwise well-drained fields. Areas not cleared at present should remain in forest.

Springhill Series (10,657 acres)

Springhill soils are found on level to gently undulating topography and are associated with the well-drained Shulie series. They are imperfectly drained, occurring where surface and lateral drainage is restricted by topography and bedrock.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Very dark brown (10YR 2/2), semidecomposed, felty organic matter; pH 3.9.
Ae	0-3	Light brownish gray (10YR 6/2) sandy loam; structureless; friable; impregnated with organic matter in lower inch; pH 4.3.
Bfgj1	3-6	Yellowish-brown (10YR 5/6) sandy loam; weak crumb structure; friable; indistinct brown mottles; pH 4.7.
Bfgj2	6-16	Brown (10YR 4/3) sandy loam; structureless; moderately firm; yellowish-brown prominent mottles; pH 5.2.
Cgj	16+	Olive-brown (2.5Y 4/4) gravelly sandy loam; firm; mottled; porous; pH 5.2.

Organic matter in the lower Ae and upper B horizons gives this soil a more drab appearance than the Shulie series. Mottling, though partly masked in the upper part of the profile, becomes more distinct in the lower B.

Use

Practically all areas of the Springhill series are forested, supporting stands of black spruce, red spruce, fir, hemlock and maple. About 27 percent of the total area is potential farm land. The remaining 73 percent is too stony or shallow for cultivation and should remain in forest.

Bayswater Series (6,154 acres)

The Bayswater soils are imperfectly drained. They occur on gently undulating to gently rolling topography in association with the Gibraltar and Aspotogan series. They are extremely stony and of no value for agriculture. If properly managed they are capable of producing a fair to good growth of timber and tend to reproduce coniferous growth, e.g., black spruce, red spruce, fir and tamarack. Areas that have burned are generally slow to regenerate and develop a dense growth of hardhack.

The profile of a soil under undisturbed forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	5-0	Black, semidecomposed felty mor overlain by sphagnum moss; pH 3.8.
Aeg	0-4	Light brownish gray (10YR 6/2) sandy loam; structureless; friable; weakly mottled; pH 4.2.
Bfhgj1	4-10	Dark reddish brown (5YR 3/3) sandy loam; firm; crushing to medium granular fragments; yellowish-brown mottles; pH 4.7.
Bhgj2	10-17	Yellowish-brown (10YR 5/4) sandy loam; firm; structureless; brown mottles; pH 4.8.
Cgj	17+	Light brownish gray (10YR 6/2) gravelly sandy loam; firm; brown mottles; pH 5.0.

The upper B horizon may have weakly cemented concretions. Organic staining is often found in the lower B horizon.

Use

Bayswater soils are not suitable for agriculture and are poor to fairly good forest soils, depending on distance from the coast and the depth of soil over bedrock. Numerous boulders on the surface make logging operations difficult and costly.

Middlewood Series (5,014 acres)

Middlewood soils occupy gently undulating to depressional topography and are associated with the Bridgewater, Kirkhill and Riverport soils. They have developed under poor drainage. This is reflected by the soil profile and the vegetation. Most areas are forested with black spruce, tamarack, alder and red maple.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	8-0	Black, well-decomposed organic material underlying 2 to 4 inches of raw sphagnum peat moss; pH 4.4.
Aeg	0-4	Gray (5Y 6/1) silt loam; strong-brown (7.5YR 5/6) mottles; structureless; slightly plastic; pH 4.2.
Bg	4-14	Light olive gray (5Y 6/2) shaly silt loam; structureless; firm; faint, strong-brown mottles; pH 4..4
Cg	14+	Olive-brown (2.5Y 4/4) shaly loam; compact; mottled; pH 4.8.

The Middlewood soils are usually shallow. Often the Bg rests on bedrock.

Use

Middlewood soils in Guysborough County are too stony, shallow or wet for agricultural use other than pasture. They are poor forest soils and have little economic value.

Aspotogan Series (38,588 acres)

Aspotogan soils occur on depressional to gently undulating topography in association with the Halifax, Gibraltar, Danesville and Bayswater soils.

Internal drainage is restricted by relief and bedrock. The degree of development in the series is determined very largely by the soil climate. Parent material plays a less important role in the formation of its characteristics.

The profile of a soil under forest and developed from granite materials is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	5-0	Dark reddish brown (5YR 2/2) greasy mor; pH 4.2.
Aeg	0-4	Dark-gray (5Y 4/1) sandy loam; structureless; moderately friable; mottled; pH 4.4.
Bfhg1	4-8	Dark-brown (7.5YR 3/2) sandy loam; friable; structureless; strong-brown mottles; pH 4.5.
Bfhg2	8-20	Olive-gray (5Y 4/2) gravelly sandy loam; slightly firm; mottled; pH 4.6.
Cg	20+	Olive (5Y 5/3) gravelly sandy loam; moderately firm; mottled; pH 4.8.

Use

Aspotogan soils have no value for agriculture. Some areas produce commercial stands of black spruce; others grow only heath vegetation.

Soils Developed from Coarse-textured, Stratified Parent Materials

The soils in this group are the Torbrook and Hebert series (Orthic Podzols) and the Nictaux series (Ortstein Podzol). They have all developed from materials deposited by glacial or postglacial streams. The Torbrook series has developed from slaty materials, the Hebert from metamorphic materials and the Nictaux from granitic materials. Differences in resistance of these materials to weathering and soil-forming processes have produced soils with different profile and land-use characteristics.

Torbrook Series (1,774 acres)

Soils of this series occur on undulating to strongly rolling topography at New Harbour, Goldboro, Harpelville and River St. Mary's. They are found mostly on the remnants of gravel terraces along the New Harbour estuary and as shallow deposits over bedrock or till in a few inland areas.

The profile of a soil under spruce and fir forest is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	2-0	Very dark brown (10Y 2/2) felty mor; pH 4.2.
Ae	0-5	Gray (5Y 5/1) shaly sandy loam; structureless; friable; pH 4.4.
Bfh1	5-13	Yellowish-brown (10YR 5/6) sandy loam; fine crumb structure; friable; pH 4.6.
Bfh2	13-24	Dark yellowish brown (10YR 4/4) shaly sandy loam; structureless; moderately firm; pH 4.8.
C	24+	Unconsolidated gravel; chiefly olive-brown (2.5Y 4/4) slate fragments; pH 5.2.

The cultivated (Ap) layer is dark yellowish brown (10 YR 4/4) sandy loam and has a fairly well developed granular structure.

Use

About 56 percent of the Torbrook soils are arable. However, the topography is hilly and the soils are droughty. They are used for growing vegetables, small fruits and forage crops on relatively small holdings. In the absence of better soils they serve a useful purpose in the areas in which they are found. The remaining 38 percent of the soils are too stony for farming and should remain in forest.

Hebert Series (7,784 acres)

Areas of the Hebert series are scattered throughout the County, usually as narrow terraces along existing rivers or where rivers and streams flowed in glacial or postglacial times. They occur on kames, eskers and outwash plains of stratified gravels of igneous and metamorphic origin and are excessively drained. Most areas are small, but larger ones occur at Goldboro, New Harbour, Stillwater, Sherbrooke, Upper Big Tracadie and Country, Indian and Isaacs harbours.

The profile of a soil forested with fir, spruce, maple and yellow birch is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Very dark brown (10YR 2/2), semidecomposed felty mor; pH 3.8.
Ae	0-3	Pinkish-gray (7.5YR 7/2) sandy loam; structureless; slightly firm; pH 4.6.
Bfh	3-5	Strong-brown (7.5YR 5/6) sandy loam; weak crumb structure; friable; pH 4.8.
Bfcj	5-30	Yellowish-brown (10YR 5/6) gravelly sandy loam; structureless; weakly cemented; pH 5.2.
C	30+	Dark grayish brown (10YR 4/2) gravel and coarse sand; firm in place; very porous; pH 5.5.

Figure 9.—Interbedded coarse sand and gravel are the parent materials of the Hebert series.

The materials from which the Hebert soils have developed vary in size from sand to cobbles (Figure 9). Complex interbedding of sand and gravel produces a correspondingly wide range of gravel and cobble content in the solum.

Use

Nearly 90 percent of the Hebert soils in Guysborough County are classed as arable but only 24 percent have more than marginal value for farming. The latter areas are used for vegetables, small fruits, potatoes and forage crops. The

remaining areas, because of size, location, topography and droughtiness, are severely limited for farming. These and some very stony areas should be left in forest. Hebert gravels are important road-building materials.

Nictaux Series (2,304 acres)

Soils of the Nictaux series are found on nearly level to strongly undulating topography near Larry's River and west of Gammon Cove. They have developed on deposits of granitic sand and gravel thinly spread over glacial till or bedrock.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
L-H	3-0	Very dark brown (10YR 2/2) felty mor; pH 4.2.
Ae	0-4	Pinkish-gray (7.5YR 6/2) loamy sand; structureless; gritty; pH 4.5.
Bfh	4-6	Dark-brown (7.5YR 3/2) sandy loam; medium crumb structure; friable; pH 4.8.
Bfcj	6-18	Strong-brown (7.5YR 5/6) gravelly loamy sand; weakly cemented; porous; pH 5.2.
C	18+	Grayish-brown (2.5Y 5/2) gravelly sand; firm; pH 5.4.

Use

No areas of Nictaux soil in the County are suitable for farming. A few small garden plots occur at Larry's River, but elsewhere stoniness and shallowness make it unsuitable for agriculture. Though capable of supporting fairly good forest growth, most areas are sparsely wooded or covered with heath vegetation.

Where the granitic materials are gravelly and deep they make good sources of road-building materials.

Immature Soils on Alluvial Deposits

Three series are included in this group. They are the well-drained Cumberland, the imperfectly drained Bridgeville and the poorly drained Chaswood series.

These soils occur on alluvial sediments recently deposited along streams and rivers. Flooding has prevented the development of distinct horizons, but gleying or mottling occurs in the imperfectly and poorly drained areas.

Cumberland Series (5,344 acres)

Cumberland soils occur as well-drained to moderately well-drained bottomlands or alluvial flats along rivers and streams. Practically all areas were once cleared farmland.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
Ap	0-6	Brown (7.5YR 4/2) sandy loam; well-developed crumb structure; friable; pH 5.3.
C	6-12	Brown (10YR 4/3) loam; structureless; very friable; pH 5.6.
	12-18	Reddish-brown (5YR 4/3) loam; structureless; very friable; pH 5.5.
	18-24	Reddish-brown (5YR 4/3) loam; structureless; very friable; light reddish brown, indistinct mottles; pH 5.4.
	24-30	Brown (7.5YR 5/4) loam; structureless; porous; some dark streaks and mottles; pH 5.5.

Surface drainage is rapid but a high water table during wet seasons may produce mottling in the lower subsoil.

The surface textures range from gravelly loam to sandy loam. Gravel strata or lenses may occur at any depth, particularly where there is frequent flooding. Most areas have a fine sandy loam texture, but very gravelly areas occur at West Erinville, North Intervale and Upper Big Tracadie.

Use

Most areas of the Cumberland soils are used for agriculture. They are loamy, friable, easily tilled, moderately fertile and responsive to liming and fertilization. However, because of hazards from killing frosts, seasonal flooding, stream erosion and distance to markets, their use is restricted largely to forage crops and pasture.

Bridgeville Series (391 acres)

Bridgeville soils occur on imperfectly drained areas of alluvial flats in association with the Cumberland and Chaswood series. The imperfect drainage is due to a high water table and is reflected in vegetation on the surface and the degree of mottling throughout the solum. An increase in surface organic matter usually accompanies increasingly poor drainage.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
Ap	0-6	Very dark brown (10YR 2/2) loam; fine crumb structure; friable; pH 5.0.
Cgj1	6-17	Brown (7.5YR 5/2) loam; slightly plastic; moderately friable; strong-brown mottles; pH 5.3.
Cgj2	17-30	Brown (7.5YR 5/4) loam; structureless; moderately friable; strong-brown mottles; pH 5.4.

Like the Cumberland, the Bridgeville series may be underlain with gravel at any depth and gravel lenses and smears occasionally appear on or near the surface.

Use

The Bridgeville soils have uses similar to those of the Cumberland series. The relatively high water table can usually be lowered by an open or tile drainage system.

Chaswood Series (753 acres)

The Chaswood soils are poorly drained and are found on alluvial flats in association with the Cumberland and Bridgeville series. They are wet throughout the year and during some periods may be covered with water. Restricted drainage is due almost entirely to a high water table, which reaches or closely approaches the surface.

A typical profile is described as follows:

Horizon	*Depth Inches*	*Description*
Ap	0-6	Very dark grayish brown (10YR 3/2) loam; greasy; pH 4.8.
Cg	6-30	Gray (10YR 5/1) silt loam; structureless; mottled with dark-brown stains; very wet; pH 5.1.
C	30+	Dark grayish brown (10YR 4/2) sand and gravel; some iron staining; pH 5.4.

The Chaswood profile is difficult to examine. Excessive water often covers the soil, or rises quickly in the test pits. The surface is usually covered with coarse swamp grass, sedges and mucky mineral soil.

Use

Without adequate drainage, Chaswood soils have little value except as poor pasture. With drainage, they should be very productive for forage crops and frost-resistant leafy vegetables. However, seasonal flooding and risk of frost make their use hazardous except for grass crops and pasture.

Soils Developed from Organic Materials

All organic deposits in the County were mapped as peat. The peat has developed primarily from sphagnum moss. Some small areas are composed of sedge peat, particularly along stagnant sections of streams.

Peat (35,591 acres)

Numerous deposits of peat occur throughout the County. The largest acreage is on level to depressional topography in the area south of the St. Mary's River. There, bogs usually occupy old lake beds that have filled or are filling with peaty deposits. These deposits range from raw sphagnum, swamp grasses and sedges on the surface to mucky sedimentary peat at variable depths.

Usually there is no forest vegetation, but stunted black spruce, alder and tamarack sometimes grow on the shallow areas.

Use

Most peat bogs, because of their size, inaccessibility or location, have little immediate value for either agriculture or forestry. Where the bogs are accessible and easily drained, some could be used as a source of peat moss. A number of bogs in favorable locations could be developed for potato or vegetable production.

Miscellaneous Soils and Land Types

Areas in this class occupy about 11 percent of the County and include salt marsh, coastal beach and very shallow areas mapped as rock.

Salt Marsh (84 acres)

Salt marshes are of minor importance in Guysborough County. They occur as olive-brown mineral tidal deposits in bays and inlets, usually protected by sand and gravel bars. They are covered with salt-tolerant marsh grass, sea blite and spurrey and are of value as wildfowl habitat.

Coastal Beach (1,255 acres)

Most areas of coastal beach are sand and gravel bars protecting shallow bays and inlets. Since the bars are continually building and wearing away, they do not develop horizons. Some of the beaches are potential tourist attractions

Rock Land (115,198 acres)

Areas mapped as rock land occur chiefly in the southern half of the County in areas underlain by granite and quartzite. The bedrock outcrops over much of the area and is seldom more than a foot from the surface.

Drainage ranges from excessive to very poor in these areas.

Use

Areas mapped as rock land are suitable only for forestry, wildlife and recreation. Except where the bedrock outcrops, such areas are covered with trees or shrubs.

AGRICULTURE AND LAND USE

Present Land Use

There were 372 farms in the County in 1961 (Table 5). These had an average of 220 acres but only 11 percent of this was classed as improved land. Farms occupied only 8 percent of the land area. The remainder is forest land, brush land or barrens, owned by lumber companies, non-farmers and the Crown.

TABLE 5.—Acres of Occupied Land in Various Uses, 1961

Total land area	998,432
Area in farms	81,665
Number of farms	372
Improved land	8,292
Field crops[1]	4,991
Pasture	1,132
Other	2,169
Unimproved land	73,373
Woodland	56,091
Other	17,282

[1]Including fruits and vegetables.

There were 4,991 acres of field crops in 1961 (Table 6). Of this area 78 percent was in hay, 7 percent in oats and corn used for fodder, 2.5 percent in potatoes and the remainder (6.5 percent) in roots, vegetables, and tree and small fruits. An additional thousand acres or more of rough land has been developed for growing lowbush blueberries. This area was not included in Table 5 or 6.

TABLE 6.—Acres of Field Crops, 1961

All field crops[1]	4991
Hay	3884
Grain	311
Oats for hay	209
Potatoes	125
Corn for fodder	122
Turnips, swedes, mangolds	15
Other	325

[1]Including fruits and vegetables.

Dairying and mixed farming are the most important agricultural industries. About 3,600,000 pounds of milk are produced annually. About half of this is used on the farm; 25 percent is sold as fluid milk and the remainder is separated on farms. The cream is sold to creameries or is used for buttermaking on the farm. The skim milk is fed to livestock, chiefly pigs and young calves. The principal livestock raised are sheep, cattle and poultry (Table 7). Sale of meat, wool and eggs contributes to the gross farm income.

TABLE 7.—Types and Numbers of Livestock, 1961

Sheep	4,154
Cattle	2,601
Horses	313
Swine	265
Hens and chickens	13,672
Turkeys	75
Ducks	23
Geese	11

Guysborough County is mostly forested. Tables 9 to 11 show that 166,000 acres, or 16 percent, are suitable for agriculture and 880,000 acres, or 84 percent, are suitable only for forestry, recreation and wildlife. The potential agricultural land is not likely to be developed in the near future, since it includes valuable forest land that should remain in forest until it can be used more efficiently for agriculture.

Forest products are an important source of revenue in the County, but overcutting, indiscriminate slashing of better forest species and burning of large tracts by forest fires have seriously reduced the stands. Guysborough County is no exception to the statement that the forests of Nova Scotia are producing less than half their potential.

Table 8 shows the acreages of various forest resources in the County. Detailed information on forest stands, allowable cuts and other useful information on forest management can be obtained from *The Forest Resources of Nova Scotia.*[3]

TABLE 8.—Acreages of Various Forest Resources[1]

	Acres	Percent of total area
Forested land	761,149	72.4
Productive forest	758,075	72.1
Coniferous	460,881	43.8
Mixed	196,635	18.7
Deciduous	100,559	9.6
Depleted forest	3,074	0.3
Nonforested and nonproductive land		
Brush land, rock barren, old burn not restocking	158,920	15.1
Waste land		
Tidal mud flats, muskeg with stunted trees, sand and gravel pits, capes and quarries	41,485	4.0
Agricultural and other improved land	38,053	3.6
Water		
Lakes, rivers and estuaries	51,941	4.9
Total	1,051,648	100.0

[1]Hawboldt, L. S., and R. M. Bulmer. The forest resources of Nova Scotia. Nova Scotia Department of Lands and Forests, p. 121. 1958.

Management of Soils

The following is information on practices in soil management.

Drainage

Poorly drained soils must be drained by open ditches or tile drainage before satisfactory yields can be obtained.

High-value crops will usually justify expensive or complex drainage systems but forage and grain crops may not. In Guysborough County, artificial drainage would evidently be useful mainly in improving small wet areas in otherwise well-drained fields.

[3]Hawboldt, L. S., and R. M. Bulmer. The forest resources of Nova Scotia. Nova Scotia Department of Lands and Forests. 1958.

Irrigation

Irrigration boosts crop yields. The cost of installation, however, may make its use prohibitive for low-value crops. For some vegetable and small-fruit crops, particularly strawberries, it has proven very successful. The chief advantages of an irrigating system for these crops is in supplying water during dry periods and for the prevention of frost damage in the spring and fall. Crops on sandy soils that are low in organic matter will lack moisture even in short periods of dry weather.

Fertility

All upland soils in the County are low in natural fertility. They are also acid throughout the profile. Proper management of these soils therefore will involve liming, conservation of humus and raising the level of fertility by growing legumes and using commercial fertilizers.

Few crops grow well on an acid soil. This is not due to the acidity alone since soil acidity in itself is not harmful to most plants. It is the secondary effects of soil acidity that are unfavorable to plant growth. Acid soils usually contain soluble aluminum in amounts toxic to plants. Also, beneficial soil bacteria, such as those that convert organic nitrogen to nitrate and those that fix atmospheric nitrogen, do not thrive in an acid medium. High soil acidity usually indicates a low level of available calcium and magnesium in the soil. Most crops and soil bacteria require fairly high levels of these elements for optimum growth.

Except for a few crops, notably potatoes, strawberries and blueberries, the soil pH should be raised to between 6.0 and 7.0 for good growth. In this range there is optimum bacterial activity and soluble aluminum is reduced to a low level, but there is little danger of lowering soluble manganese or iron to the deficiency level. Boron, however, may become deficient at this pH.

Lime should be applied to the soil at two to three tons per acre on plowed land. Additional lime should be applied in four or five years if the need is indicated.

Humus

Humus is an essential constituent of agricultural soils and maintaining it is one of the greatest problems in soil management. It is destroyed by clean cultivation and summer-fallowing. It is conserved by maintaining the soil under grass cover. Healthy crops of grasses and legumes, along with the wise use of barnyard manure, will maintain and usually raise the level of soil humus. In livestock farming it should not be necessary to plow down green-manure crops. This costly practice supplies a good deal of organic matter that breaks down in a short time, releasing its plant nutrients to the soil. However, it has only a short-term effect on the level of soil humus. The plant nutrients taken up by the green-manure crop and later released may be applied directly and without delay in commercial fertilizer.

The maintenance of a reasonably high level of decomposing organic matter in the soil improves its moisture-holding capacity, its structure and its resistance to erosion and leaching, and promotes the development of beneficial microorganisms.

Commercial Fertilizers

Adequate drainage, use of lime and maintenance of humus levels will not ensure satisfactory crop yields. These practices must be supplemented by the use of chemical fertilizers. The plant nutrients used by the crops or lost through leaching must be replaced in some way. A portion is returned through plant and animal residues. Some nitrogen may be replaced by nitrogen-fixing soil bacteria, but most soils will not regenerate by natural means all the available

nitrogen, phosphorus, calcium and potash needed for good crops. Crops of high value, such as most vegetables, flowers, small fruits and potatoes, may return the cost of heavy rates of fertilizer application.

Foliar sprays can be used for crops showing deficiency symptoms; for instance, epsom salts is used for magnesium deficiency and borax for boron deficiency. Rates of application will depend on the crop.

Erosion

The erosion hazard in Nova Scotia is not as great as in many other areas of North America because so little land is cultivated. Fields in sod and not overgrazed are in little danger from erosion. However, continuous intensive production of root crops, vegetables or potatoes on many soils may result in very severe gully, rill and sheet erosion.

To ensure that water erosion losses in Guysborough County are kept to a minimum the following recommendations should be observed:

1. Vegetables and root crops should be grown only on soils with A and B slopes (0-8 percent). However, on slopes of 4-8 percent, moderate to severe erosion can occur under clean cultivation. High humus levels and plowing and cultivating with the contour will reduce this danger.

2. Soils with C slopes (9-16 percent) will show moderate to severe erosion under clean cultivation and are best suited to pasture or hay. If cultivated, these soils should be strip-cropped on the contour and have grassed drainageways.

3. Soils with D slopes (17-30 percent) are too steep for cultivation, but may make good pasture if reseeded and fertilized.

4. Soils with E slopes (above 30 percent) should be left in forest, or reforested if cleared.

Long smooth slopes are more subject to erosion than short irregular ones in the same slope class. Soils with a high level of organic matter and good structure will resist erosion more readily than those without these characteristics.

Soil Capability Classes for Agriculture

The mineral soils are grouped into classes on the basis of their suitability and limitations for agricultural use (Figure 10, Tables 9-14). Classes 1 to 3 are considered suitable for sustained production of common field crops. Class 4 is marginal for cultivated crops, Classes 5 and 6 are capable of use for permanent pasture, and Class 7 is for soils and land types considered unsuitable for cultivated crops or permanent pasture. Though the soil areas in Classes 1 to 4 are suited for cultivated crops they are also suited for permanent pasture. Soil areas in all classes may be suited for forestry, wildlife, and recreational uses. In this classification, trees and tree fruits are not considered as cultivated or common field crops.

Present forest cover is not generally considered a factor in this classification, but it may be used in placing soil areas in Class 7 if costly clearing would only result in placing the areas in Class 6.

In each class the soils may be divided into subclasses depending on the main limitation or limitations detrimental to use. The symbols denoting these limitations are as follows:

Symbol	*Limitation*
c	climate
e	erosion
i	overflow
n	salinity

p	stoniness
r	shallowness
s	adverse inherent soil characteristics
t	topography, slope or pattern
w	excess water other than from overflow

The subclass provides information on the kind, and the class indicates the intensity, of the limitation.

In Tables 9-14 the soils are subdivided into textural groups. In these groups, soils having the same subclass limitations have nearly uniform management requirements and potential uses. The soils are listed with their topographic and stoniness symbols as these appear on the soil maps.

The symbols for topography are:

Symbol	*Topography*	*Slope, %*
A	Level or nearly level	0-2
B	Undulating	3-8
C	Rolling	9-16
D	Strongly rolling to hilly	17-30
E	Hilly to mountainous	31+

The symbols for stoniness are:

Symbol	*Degree of Stoniness*
0	Stone-free
1	Slightly stony; no hindrance to cultivation
2	Moderately stony; enough stone to interfere with cultivation unless removed
3	Very stony; enough stone to be a serious handicap to cultivation
4	Excessively stony; too stony for cultivation

Soil Capability Class 1

The soils in this class have no significant limitations that restrict their use for crops. They have level or gently sloping topography, are deep and well to imperfectly drained and have good water-holding capacity. These soils are naturally well supplied with plant nutrients. They are easily maintained in good tilth and fertility, and erosion hazard (wind and water) is low. They are moderately high to high in productivity for a wide range of field crops. No soils in Guysborough County meet these requirements.

Soil Capability Class 2

The soils in this class (Table 9) have moderate limitations that reduce the choice of crops or require moderate conservation practices. They require careful management, including conservation practices to prevent soil deterioration or to improve air and water relations when the soils are cultivated. The limitations are not severe and the practices are easy to apply. Moderate limitations, singly or in combination, may include the effects of: (1) topography, (2) moderate susceptibility to wind or water erosion, (3) somewhat less than ideal depth, (4) some difficulty in tillage owing to structure or stoniness, (5) wetness correctable by drainage but existing permanently as a moderate limitation, (6) occasional damaging overflow, (7) slow permeability of the subsoil, and (8) moderate climatic limitations on management and use.

Soils in this class have good water-holding capacity and are either well supplied with plant nutrients or highly responsive to fertilizer. They are moderately high to high in productivity for a fairly wide range of crops. Only 0.3 percent of the soils in Guysborough are in this class.

TABLE 9.—Textures, Subclasses and Acreages of the Soils in Soil Capability Class 2, Those with Moderate Limitations for Agriculture

Texture	Subclass	Soil series, topography and stoniness		Acres
Medium textured	2i	Cumberland	A-0	2,598
			B-1	147
	2w	Bridgeville	A-0	77
	2s	Kirkhill	B-1	171
				2,993
Moderately coarse textured	2s	Westbrook	B-2	108
				108
Total				3,101

Soil Capability Class 3

Soils in this class (Table 10) have moderately severe limitations that reduce the choice of crops or require special conservation practices. The soils (Figure 11) have more severe restrictions than those in Class 2 and conserva-

TABLE 10.—Textures, Subclasses and Acreages of the Soils in Soil Capability Class 3, Those with Moderately Severe Limitations for Agriculture

Texture	Subclass	Soil series, topography and stoniness		Acres
Moderately fine textured	3s	Millbrook	B-2	11,335
			C-1	2,200
			C-2	54,890
	3t	Woodbourne	C-2	538
	3t	Wolfville	C-1	733
			C-2	3,085
				72,781
Medium and moderately coarse textured	3i	Cumberland	A-0	2,420
			B-1	179
	3i	Bridgeville	A-0	64
			A-1	56
			A-2	60
	3t	Westbrook	C-1	1,016
			C-2	634
	3p	Kirkhill	B-2	12,348
			C-1	5,783
			C-2	21,386
	3p	Bridgewater	B-2	155
			C-2	785
	3p	Springhill	B-2	2,889
	3p	Riverport	B-2	5,827
			C-1	1,227
			C-2	347
	3p	Thom	C-2	4,278
				59,454
Coarse textured	3s	Hebert	A-1	112
			A-2	56
			B-0	199
			B-1	243
			B-2	1,259
				1,869
Total				134,104

tion practices are usually more difficult to apply and maintain. Limitations adversely affect the timing and ease of tillage, planting and harvesting; the choice of crops; the application of conservation practices; or some combination of these limitations. The limitations may result from: (1) moderately rough topography, (2) high susceptibility to wind or water erosion or adverse effects of past erosion, (3) less than ideal depth, (4) difficulty in tillage owing to structure or stoniness, (5) wetness or continued waterlogging after drainage, (6) frequent overflow accompanied by crop damage, (7) moderately low water-holding capacity, (8) transitory moderate salinity, (9) very slow permeability of the subsoil, (10) moderate fertility and only fair response to fertilizer, and (11) moderately severe climatic limitations on management and use.

Class 3 soils are medium to moderately high in productivity for a range of crops. They occupy about 13.4 percent of the land area.

Soil Capability Class 4

Soils in this class (Table 11) have severe limitations that restrict the choice of crops, require special conservation practices and very careful management, or both. The soils (Figure 11) have such limitations that they are suited for only a few crops, or the harvest for a range of crops may be low in relation to inputs, or the risk of crop failure is high. Limitations may result from (1) rough topography or steep slopes, (2) high susceptibility to wind or water erosion and very severe effects of past erosion, (3) shallowness, (4) serious difficulty in tillage owing to structure or stoniness, (5) excessive wetness with continued hazard of waterlogging after drainage, (6) frequent overflows accompanied by severe crop damage, (7) low water-holding capacity, (8) moderate salinity, (9) low fertility not easily corrected, and (10) severe climatic limitations.

TABLE 11.—Textures, Subclasses and Acreages of the Soils in Land Capability Class 4, Those with Severe Limitations for Agriculture

Texture	Subclass	Soil series, topography and stoniness		Acres
Moderately fine textured	4s	Kingsville	B-2	171
	4r	Millbrook	C-2	1,740
				1,911
Medium and moderately coarse textured	4i	Bridgeville	A-0	90
	4r	Riverport	B-2	1,721
	4t	Shulie	C-2	17,313
	4p	Halifax	B-2	494
			C-2	889
	4p	Gibraltar	C-2	76
	4p	Danesville	C-2	287
				20,870
Coarse textured	4t	Hebert	C-2	5,086
	4t	Torbrook	C-2	988
				6,074
Total				28,855

Class 4 soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a special crop. They occupy about 2.9 percent of the land area.

Soil Capability Class 5

Soils in this class (Table 12) are unsuited for cultivated crops except perennial forage crops used for permanent pasture and are responsive to improvement practices. They have such serious soil or climatic limitations as to make them unsuited for the production of field crops. However, they are suited to the production of adapted grasses and legumes and are responsive to practical improvement practices such as reseeding, liming, fertilizing, and water control. Only 0.4 percent of the soils were placed in this class.

TABLE 12.—Textures, Subclasses and Acreages of the Soils in Soil Capability Class 5, Those Capable of Use as Improved Permanent Pasture

Texture	Subclass	Soil series, topography and stoniness		Acres
Moderately fine textured	5t	Millbrook	D-2	646
	5t	Wolfville	D-1	112
	5w	Kingsville	A-2	434
				1,192
Medium textured	5t	Bridgewater	D-2	578
	5w	Middlewood	A-2	367
	5w	Chaswood	A-0	765
			A-1	88
				1,798
Moderately coarse textured	5t	Thom	D-2	893
				893
Total				3,883

Soil Capability Class 6

Soils in this class (Table 13) are unsuited to cultivation but are capable of use for unimproved permanent pasture. They have some natural grazing capacity for farm animals but have such serious soil, climatic, or other limitations as to make impractical the application of improvement practices that can be carried out on Class 5 soils. Less than 100 acres were placed in this class. Most Class 7 areas when cleared become Class 6, and areas of Class 6 land too small to map or reverting to forest are included in Class 7.

TABLE 13.—Textures, Subclasses and Acreages of the Soils in Land Capability Class 6, Those Capable of Use as Unimproved Permanent Pasture[1]

Texture	Subclass	Soil series, topography and stoniness	Acres
Moderately fine textured	6i	Salt Marsh	84
			84
Total			84

[1]Wooded soils that would be in this class if cleared are placed in Class 7.

Soil Capability Class 7

Soils in Class 7 (Table 14) are unsuited for agriculture. They have very serious climatic, soil or other limitations that prevent their use for cultivated

TABLE 14.—Textures, Subclasses and Acreages of the Soils in Land Capability Class 7, Those Unsuited for Agriculture

Texture	Subclass	Soil series, topography and stoniness		Acres
Moderately fine textured	7p	Wolfville	C-3	21,629
	7p	Millbrook	B-3	3,719
			C-3	1,271
				26,619
Medium textured	7p	Kirkhill	C-3	12,295
			D-3	2,033
	7p	Bridgewater	B-3	1,861
			C-3	5,273
			D-3	120
			B-4	291
			C-4	2,810
	7p	Riverport	B-3	50,828
			C-3	1,658
			B-4	5,209
	7p	Bridgeville	A-3	44
	7p	Middlewood	A-3	231
			B-3	2,104
			A-4	383
			B-4	1,929
				87,069
Moderately coarse textured	7p	Thom	C-3	41,452
			D-3	7,118
			C-4	382
	7p	Shulie	B-3	175
			C-3	28,971
	7p	Halifax	C-3	49,684
			D-3	2,120
			B-4	4,396
			C-4	239,595
			D-4	9,326
	7p	Gibraltar	C-3	837
			B-4	4,739
			C-4	51,915
			D-4	717
	7p	Springhill	B-3	7,768
	7p	Mira	B-3	1,495
	7p	Danesville	B-3	7,576
			C-3	1,076
			B-4	54,670
	7p	Bayswater	C-3	502
			B-4	5,329
			C-4	323
	7p	Aspotogan	A-4	33,184
			B-4	5,404
	7r	Rockland		115,198
Total				673,952
Coarse textured	7p	Hebert	B-3	259
			C-3	570
	7p	Torbrook	C-3	670
			D-2	116
	7p	Nictaux	B-3	195
			C-3	307
			B-4	1,710
			C-4	92
	7s	Coastal Beach		1,255
				5,174
Total				792,814

crops or improved permanent pasture (Figures 11 and 12) and are not naturally suited for unimproved permanent pasture. About 80 percent of the soils of Guysborough County are in this class.

Organic Soils

Organic soils are not rated in the soil capability classes. However, important areas of peats and mucks are shown by the letter O (Figure 10) or by the symbol OX if they are improved for agricultural use. Peat occupies 35,591 acres, or 3.5 percent, of the land area.

Ratings of the Soils for Crops

In Guysborough County, stoniness, texture, topography, drainage and climate determine the suitability of a given soil for specific crops.

Areas classed as good crop land may have within their boundaries small areas generally unsuited to agricultural use. Areas classed as fair to poor crop land may have small areas suited to the growing of most crops common to the area. A soil rated as unsuitable for most crops may be ideally suited to the production of some specific crop and be more valuable for that purpose than a more highly rated soil suitable for growing a wide range of crops.

TABLE 15.—Suitability Ratings[1] of the Soils in Classes 2, 3 and 4 for Selected Crops

Soil	Acres	Hay	Grain	Pasture	Potatoes	Vegetables
Class 2: Good	3,101					
Cumberland	2,745	G	G	G	F-G	F
Bridgeville	77	G	F-G	G	F	F-P
Kirkhill	171	G	G	F-G	F-G	F
Westbrook	108	G	F-G	F-G	G	F-G
Class 3: Good to Fair	134,104					
Cumberland	2,509	G	F	G	F	F-P
Bridgeville	180	G	F	G	F-P	F-P
Woodbourne	538	G	F-G	G	F-G	F
Wolfville	3,818	G	F-G	G	F	F
Millbrook	68,425	G	F	G	F-P	P
Westbrook	1,650	F-G	F-G	F	F	F
Kirkhill	39,517	F	F	F-G	F-G	F-P
Bridgewater	940	F-G	F-G	F-G	G	F
Thom	4,278	F	F	F-G	F-G	F-G
Riverport	7,401	F-G	F	F-G	F	F
Springhill	2,889	F-G	F	F-G	F-P	F-P
Hebert	1,869	F	F	F-P	F-G	F
Class 4: Fair to Poor	28,855					
Bridgeville	90	F-G	P	G	P	P
Kingsville	171	F-P	P	F	P	P
Millbrook	1,740	F	P	F-G	P	P
Halifax	1,383	F-P	F-P	F	F-P	F-P
Riverport	1,721	F	F-P	F-G	F-P	F-P
Shulie	17,313	F	F	F	F	F-P
Gibraltar	76	F-P	F-P	F	F-P	P
Danesville	287	F-P	F-P	F-G	P	P
Hebert	5,086	P	P	P	F-P	P
Torbrook	988	P	P	F-P	F-P	F-P

[1]G, good; F, fair; P, poor.

The presence of nearby markets for produce may make it feasible to clear and cultivate areas that should normally be left in forest. Conversely, it may be economically unsound to clear and cultivate more favorable soils in less accessible areas.

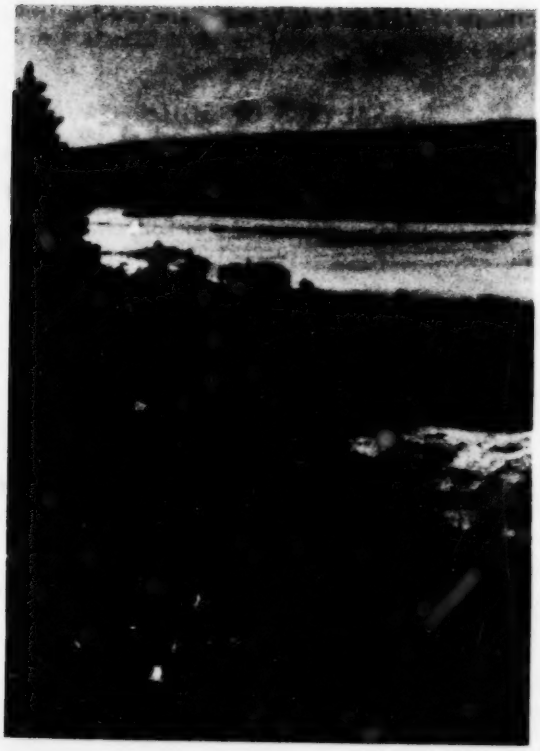

FIGURE 11.—Alluvial flats on the St. Mary's River near Stillwater. Class 3 soils occur on the flats, Class 4 soils in the foreground and Class 7 soils in the background.

FIGURE 12.—Halifax soil, in Class 7, has severe limitations even for forestry.

In Table 15 the soils of Classes 2, 3, and 4 are rated on suitability for production of the principal crops grown in the area. Classes 5 to 7 are unsuitable for cultivated crops.

ANALYSES OF SOILS

A number of representative soil profiles were sampled for chemical and physical analyses (Tables 16 and 17). Much of the information contained in Table 16 is of interest to workers in genesis and classification. Table 17 has more immediate practical value as a guide to soil amendment and fertilizer recommendations.

pH

The Millbrook, Bridgewater and Shulie soils are strongly acid throughout the profile and have developed from acidic parent materials.

The average pH of cultivated fields sampled in 1960 was 5.5. The pH ranged from 4.7 to 6.6. These data strongly indicate that all untreated upland soils in the County are very acid. The alluvial soils, though less acid than the upland soils, are too sour for maximum crop production and should be limed.

Loss on Ignition

The loss on ignition is obtained through burning the sample at 700° C for one hour. The loss in weight is not all organic material. Up to 30 percent of the loss on ignition is attributable to water of hydration and other inorganic constituents.

The average loss on ignition of cultivated soils sampled in the County during 1960 was about 10.5 percent. Normally a soil with a loss of 7 to 8 percent has an adequate supply of humus. Guysborough soils are all well above this level.

Lime Requirement

According to tests on all soils sampled in 1960, the average lime requirement for the County was 4.2 tons of ground limestone per acre. The range was from 1 ton per acre on previously limed soils to 5 or more tons on unlimed soils.

Nitrogen

The level of this element is closely related to the humus content. Guysborough County soils have a fairly good supply of total nitrogen. However, applications of nitrate fertilizers are needed, particularly in the early spring when biological activity is low. Additional applications during the growing season may be needed for fast-growing leafy crops.

Available Calcium and Magnesium

Table 16 indicates that unlimed Guysborough County soils are low in available calcium and magnesium. Intensive cropping would probably result in serious deficiencies of these elements. Applications of dolomitic limestone will supply both calcium and magnesium. Calcium is also supplied in superphosphate fertilizer. Where magnesium deficiency symptoms occur in a crop, spraying with an epsom salt solution is recommended as a corrective measure.

TABLE 16.—Chemical and Physical Analyses of Four Representative Soil Profiles

Horizon	Depth Inches	Loss on ignition	Total carbon	pH	Total N	Total SiO_2	Total R_2O_3	Total Fe_2O_3	Total CaO	Total MgO	Free Fe_2O_3	Milliequivalents per 100 grams of soil				Gravel	Total sand 2-.05 mm.	Fine sand .25-.05 mm.	Silt .05-.002 mm	Clay Below .002 mm.
												Exchange capacity	Exchangeable Ca	Exchangeable Mg	Exchangeable K					
		%	%		%	%	%	%	%	%	%					%	%	%	%	%
Millbrook silt loam																				
L–H	3–0	86.3	47.9	3.6	1.58	9.1	0.8	0.6	0.52	0.27	—	94.2	7.64	6.33	1.50	—	—	—	—	—
Ae	0–3	9.0	4.2	3.9	0.19	72.4	13.9	2.5	0.17	0.23	1.0	20.3	0.12	0.22	0.14	16.8	23.5	13.7	54.0	22.5
B(h)g	3–12	6.0	1.8	4.8	0.14	71.1	18.7	4.6	0.20	0.55	2.0	15.9	0.66	0.11	0.09	43.1	27.4	16.0	54.1	18.5
BCg	12–20	3.4	0.5	5.0	0.11	71.3	19.4	5.0	0.20	0.84	1.3	6.9	0.42	0.22	0.07	23.0	41.7	26.6	42.7	15.6
C	20+	3.2	0.1	5.0	0.04	66.7	23.1	5.9	0.25	1.23	1.8	4.7	1.50	1.11	0.15	37.3	30.6	18.9	40.9	28.5
Bridgewater silt loam																				
L–H	2–0	70.2	39.0	3.8	1.50	21.6	5.3	1.9	0.30	0.20	—	86.3	3.20	4.83	1.16	—	—	—	—	—
Ae	0–2	5.1	2.4	3.9	0.11	80.3	11.5	1.9	0.20	0.17	0.6	7.6	0.42	0.22	0.08	5.7	44.2	37.3	46.8	9.0
Bfh_1	2–9	11.3	4.4	4.9	0.21	62.1	21.5	6.2	0.32	0.60	2.4	18.9	1.26	0.33	0.05	36.9	41.1	31.4	56.0	2.9
Bfh_2	9–17	6.1	1.9	5.1	0.11	67.6	21.0	5.9	0.27	0.51	1.7	10.9	0.24	0.17	0.02	40.6	46.5	29.2	50.7	2.8
C	17+	3.6	0.9	5.1	0.06	71.1	19.9	5.1	0.37	0.78	1.0	5.3	0.36	0.28	0.02	42.7	51.1	32.4	45.7	3.2
Skulle silt loam																				
L–H	2–0	80.1	43.1	3.5	1.32	15.1	2.0	1.0	0.35	0.20	—	77.5	5.68	3.83	1.89	—	—	—	—	—
Ae	0–2	6.7	3.2	3.9	0.10	91.0	3.6	1.0	0.15	0.08	0.8	13.4	0.36	0.28	0.05	17.8	40.7	34.1	53.8	5.5
Bfh_1	2–7	8.9	3.3	4.7	0.13	70.8	17.5	4.8	0.25	0.27	2.6	22.0	0.42	0.22	0.05	38.3	36.6	28.8	56.5	6.9
Bfh_2	7–17	4.5	1.0	4.9	0.06	76.1	16.6	4.0	0.20	0.36	1.8	8.7	1.14	0.11	0.02	42.6	39.0	29.6	54.5	6.5
C	17+	3.7	0.6	5.2	0.04	71.6	17.9	4.3	0.30	0.58	1.3	5.1	1.44	0.28	0.02	33.2	45.7	40.4	45.0	9.3
Cumberland fine sandy loam																				
Ap	0–6	10.2	5.0	5.3	0.19	65.8	21.6	5.9	0.82	0.80	1.8	14.5	2.40	0.33	0.11	1.2	54.3	33.5	40.5	5.2
C	6–12	4.2	1.0	5.6	0.10	66.9	21.4	6.4	0.72	0.58	1.9	7.8	1.36	0.44	0.04	0.0	48.7	47.6	41.0	10.3
	12–18	3.6	0.8	5.5	0.08	67.2	23.5	6.0	0.77	0.76	1.8	7.1	1.01	0.33	0.05	5.0	46.7	46.1	43.4	9.9
	18–24	3.9	0.9	5.4	0.09	66.8	23.4	6.4	0.77	1.00	2.0	7.1	0.90	0.22	0.04	0.0	40.5	40.2	48.5	11.0
	24–30	3.7	0.8	5.5	0.08	72.3	22.6	6.4	0.77	0.75	2.1	7.1	0.78	0.22	0.04	0.0	41.5	41.3	48.6	9.9

TABLE 17.—Available Nutrients in Pounds per Acre[1] in Four Representative Soil Profiles

Series	Horizon	Depth Inches	Ca	Mg	K	P
Millbrook	L–H	3–0	293	146	112	14
	Ae	0–3	48	53	109	12
	Bfhg	3–12	264	26	70	16
	BCg	12–20	168	53	54	12
	C	20+	600	266	117	34
Bridgewater	L–H	2–0	123	111	87	10
	Ae	0–2	168	53	62	8
	Bfh1	2–9	504	79	39	4
	Bfh2	9–17	96	41	16	8
	C	17+	144	67	16	10
Shulie	L–H	2–0	218	88	125	13
	Ae	0–2	144	67	39	12
	Bfh1	2–7	168	53	39	6
	Bfh2	7–17	456	26	16	4
	C	17+	576	67	16	8
Cumberland	Ap	0–6	960	79	86	12
	C	6–12	544	106	31	8
		12–18	404	79	39	22
		18–24	360	53	31	22
		24–30	312	53	31	26

[1]Calculated on the basis of 2,000,000 pounds of soil per acre to six inches deep, except that organic horizons were calculated on the basis of 193,000 pounds per acre.

Available Potassium

All of the profiles analyzed show a low level of available potassium, and adequate amounts of this element should be applied as commercial fertilizer to ensure good crops. An additional source of this element is in properly stored barnyard manure.

Available Phosphorus

The supply of available phosphorus is very low in every soil analyzed. This plant nutrient should be supplied as commercial fertilizer for good crop production. Liming will usually reduce the amount of applied phosphate fixed in unavailable forms in the soil and leave more available for plant use.

SUMMARY

Guysborough County occupies an area of 1,640 square miles on the southeastern mainland of Nova Scotia. Peat bogs, salt marsh, water, rock land and coastal beach occupy nearly 20 percent of the area. Another 64 percent is too steep, stony or poorly drained to be of value except as forest land. The remaining 16 percent has good to submarginal potential as agricultural land.

The climate is cool humid temperate with a wide range between coastal and inland areas. The frost hazard is high in the inland valleys.

About 94 percent of the soils have developed from glacial till. The remainder have developed on alluvial or glaciofluvial deposits. Textures in the till soils range from sandy loam to loam in the cultivated layer and from gravelly sandy loam to clay loam in the parent materials. Textures in the alluvial and glaciofluvial soils range from gravelly sandy loam to silt loam in the surface layer and from gravel to silt loam in the subsoil.

The well-drained soils have well-developed Podzol profiles. Soils that have imperfect drainage because of topography or characteristics of the parent mate-

rial are mottled in the profile. They are Gleyed Podzols. In poorly drained areas, the soils are strongly gleyed in all horizons and belong to the Gleysol great group. Regosols occur along the stream courses.

Altogether, 29 soil series and land types are described and mapped. They occur in areas ranging from 84 to 306,504 acres in size. The soils most suitable for cultivation are the Cumberland, Kirkhill, Wolfville and Millbrook series. Substantial areas of the Millbrook series, now forested, are potentially useful for agriculture.

About 72 percent of the County is productive forest land with conifers predominating in the stands. There is a need for an extensive forest management program in the County.

About 84 percent of the improved land is used for hay; half the remaining acreage is used for grain and the other half for potatoes, roots, small fruits and vegetables. Dairying and mixed farming are the most important agricultural industries.

The cultivated soils are above average in organic matter content but are acid and infertile. Lime and commercial fertilizers in adequate amounts are needed to grow satisfactory crops.

GLOSSARY

Alluvium—Sediments deposited by streams.

Available nutrients—Nutrients capable of being taken up by plants at a rate significant to crop production.

Coarse texture—The coarse-textured soils are sands and loamy sands.

Consistence—The degree and kind of cohesion or adhesion of the soil mass, or its resistance to deformation or rupture.

Drift—Material deposited by glacial ice or by glacial meltwater.

Fine texture—The fine-textured soils are sandy clays, silty clays and clays.

Glaciofluvial material—Material sorted and deposited by water that originated mainly from the melting of glacial ice.

Gley soil—A soil in which the colors are dull, accompanied by yellow and gray mottling produced by partial oxidation and reduction of iron through intermittent saturation with water in the presence of organic matter.

Gleysol great group—In this great group are Gleysolic soils that have an Ah horizon not more than 3 inches thick under virgin conditions. When mixed to a depth of 6 inches, this layer (Ap) has less than 3 percent organic matter or it differs from the next underlying horizon (Ae, B or C) by not more than 1.5 units of value when moist if the underlying horizon has a value of 4 or more, or by not more than 1 unit if the underlying horizon has a value of 3 or less. There may be up to 12 inches of peat on the surface.

Gleysolic order—Soils of this order are saturated with water at some season, or are artificially drained. They have developed under hydrophytic vegetation or may be expected to produce hydrophytic vegetation if left undisturbed. They may have an organic horizon less than 12 inches thick, or an Ah horizon, or both. The B and C horizons are dull colored or mottled.

Gravel—Rock fragments from 2mm. to 3 inches in diameter.

Horizon—A layer in the soil approximately parallel to the land surface and differing from adjacent layers in properties such as color, structure, texture, consistence, and biological and chemical characteristics. The main organic horizons are defined as follows:

L – An organic layer characterized by the accumulation of organic matter in which the original structures are definable.

F – An organic layer characterized by the accumulation of partly decomposed organic matter. The original structures are discernible with difficulty.

H – An organic layer characterized by the accumulation of decomposed organic matter in which the original structures are not definable.

The main mineral horizons are defined as follows:

A – A mineral horizon or horizons formed at or near the surface in the zone of maximum removal of materials in solution and suspension and/or maximum in situ accumulation of organic matter. It includes horizons in which organic matter has accumulated as a result of biological activity (Ah); horizons that have been eluviated of clay, iron, aluminum, and organic matter or any of these (Ae); horizons dominated by these conditions but transitional to the underlying B or C (AB, or A and B); and horizons markedly disturbed by cultivation or pasturing (Ap).

B – A mineral horizon or horizons characterized by one or more of the following: an illuvial enrichment (exclusive of dolomite or salts more soluble in water) of silicate clay, iron, aluminum, or organic matter (Bt, Bf, Bh, Bfh); a concentration of weathering products believed to have been formed in situ (Bt); the removal of dolomite and salts more soluble in water (Bm); an oxidation of sesquioxides that gives a conspicuously darker, stronger or redder color than overlying and/or underlying horizons in the same sequum (Bmf); a prismatic or columnar structure characterized by the presence of exchangeable sodium (Bn).

C – A mineral horizon or horizons comparatively unaffected by the soil-forming processes operative in A and B, excepting the process of gleying and the accumulation of dolomite and salts more soluble in water (Ck, Cs, Cg, and C).

The mineral horizons described in this report are denoted by the following lower-case suffixes:

c – A horizon cemented by soil-forming processes.

e – A horizon characterized by the removal of clay, iron, aluminum or organic matter; usually lighter colored than the layer below.

f – A horizon enriched with hydrated iron.

g – A horizon characterized by reduction and gray colors, often mottled.

h – A horizon enriched with organic matter. When used with A, it must show at least one Munsell unit of value darker than the horizon immediately below.

j – A horizon whose characteristics are weakly expressed. If more than one lower-case suffix is required and the property denoted by only one of them is weakly expressed, it is followed by *j* and linked to it with a bar, e.g., Bfcj.

p – A layer disturbed by the activities of man, that is, by cultivation or pasturing, or both; used only with A.

Humic Podzol great group—In this great group are Podzolic soils that have thick organic surface (L-H) horizons, a light-colored eluviated (Ae) horizon and an illuvial horizon at least 2 inches thick containing at least 10 percent organic matter (Bh). The Bh horizon may be underlain by a Bfh or Bf horizon. The solum may have a dark reddish brown hardpan. The solum is usually moderately to strongly acid.

Illuviation—The deposition of material in a horizon of the soil on removal from an overlying horizon.

Medium texture—The medium-textured soils are very fine sandy loams, loams, silt loams and silt.

Moderately coarse texture—The moderately coarse textured soils are all the sandy loams except the very fine sandy loams.

Moderately fine texture—The moderately fine textured soils are: clay loams, sandy clay loams and silty clay loams.

Mor—Unincorporated organic matter that rests with little mixing on the underlying mineral or organic-mineral horizon.

Mottles—A variegated pattern of spots and streaks of colors, usually yellows and grays, sometimes blues, indicating poor drainage.

Munsell color notation—A color designation system that specifies the relative degrees of the three simple variables of color: hue, value and chroma. Hue is the dominant color, value refers to the relative lightness of color, and chroma is the relative strength of color and increases with decreasing grayness. In writing the Munsell notation, the order is hue, value and chroma; a space is left between the hue letters and the value number, and a virgule between the two numbers for value and chroma, e.g., 5YR 5/6 is a soil color with hue 5YR, value 5, and chroma 6. It is called yellowish red.

pH—The intensity of acidity or alkalinity of a soil expressed as the logarithm of the reciprocal of the hydrogen-ion concentration. With this notation pH 7.0 is neutral; lower values indicate acidity, higher values alkalinity.

Organic order—In this order are soils that have 30 percent or more organic matter and have at least 12 inches of compact peat.

Orthic Gleysol subgroup—In this subgroup are Gleysol soils that have A, B and C horizons. They may have up to 6 inches of peat or other organic material on the surface.

Orthic Humic Podzol subgroup—In this subgroup are Humic Podzol soils in which free iron is present in the Bh horizon. This horizon is underlain by a Bfh or Bf horizon containing less than 10 percent organic matter.

Orthic Podzol subgroup—In this subgroup are Podzol soils that have an Ae horizon more than 1 inch thick and a friable Bfh or Bf horizon of high chroma. The lowest B horizon may be mottled.

Orthic Regosol subgroup—In this subgroup are Regosol soils that have no visible evidence of salts or gleying. The Ah horizon, if present, is thin or weak; and the L-H horizons, if present, are not more than 2 inches thick.

Ortstein Podzol subgroup—In this subgroup are Podzol soils that have a cemented Bfh or Bf horizon of high chroma. The cemented horizon usually underlies the Ae horizon but may underlie a friable B horizon.

Podzol great group—In this great group are Podzolic soils that have a Bfh or Bf horizon in which organic matter and sesquioxides are the main accumulation products. The B horizon contains less than 10 percent organic matter, but the Ae horizon may be underlain by a Bh horizon less than 2 inches thick and containing at least 10 percent organic matter. The solum is usually moderately to strongly acid. In cultivated soils, remnants of the Bhf or the Bf horizon are clearly visible but remnants of the Ae horizon may not be.

Podzolic order—In this order are well and imperfectly drained soils that have developed under forest or heath and have a light-colored eluviated (Ae) horizon and illuvial (B) horizons with accumulations of sesquioxides, organic matter or clay, or any combination of these. They may have organic (L-H) and mineral-organic (Ah) surface horizons.

Potential evapotranspiration—The amount of water that would be transferred from the soil to the atmosphere by evaporation and transpiration if it were constantly available.

Rego Humic Gleysol subgroup—In this subgroup are Humic Gleysol soils with an Ah or Ap horizon that grades into dull-colored, gleyed parent material.

Regosol great group—All Regosolic soils are in this great group.

Regosolic order—In this order are well and imperfectly drained soils that have no discernible horizon above the parent material or have only an organic-mineral surface horizon (Ah), or organic surface horizons (L-H) less than 12 inches thick.

Soil series—A group of soils formed from the same parent material and having horizons similar in characteristics and arrangement except for the texture of the surface soil.

Solum—The part of the soil profile above the C horizon. The most weathered part of the soil profile, or the A and B horizons.

Soil structure—The aggregation of primary particles into compound particles, the aggregates being separated by surfaces of weakness. The aggregates differ in degree of distinctness as follows: structureless (no observable aggregation or no definite orderly arrangement); massive (coherent); single-grained (noncoherent); weak, moderate and strong. The aggregates vary in size from very fine to fine, medium and coarse. They also vary in shape, or type. The types mentioned in this report are granular (aggregates more or less rounded, without smooth faces and edges, relatively non-porous), platy (aggregates with the horizontal axes longer than the vertical), subangular blocky (aggregates blocklike) with rounded and flattened faces and rounded corners.

Soil texture—The percentages of sand, silt and clay in a soil determine its texture (Figure 13). Particles from 2 to .05 mm. in diameter are called sand, those from .05 to .002 mm. are called silt and those below .002 mm. are called clay.

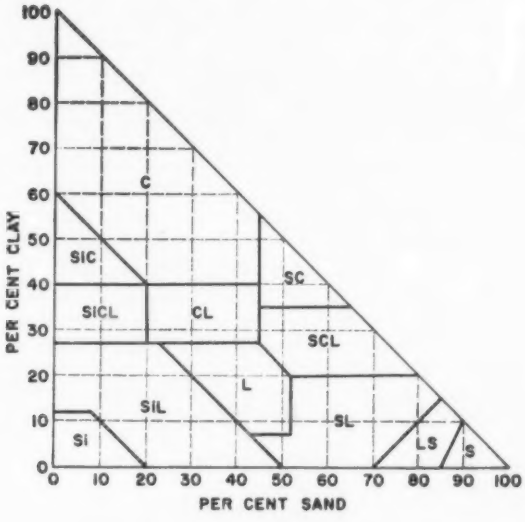

FIGURE 13.—Percentages of clay and sand in the main textural classes of soils; the remainder of each class is silt. *See* Toogood, J. A., Can. J. Soil Sci. 38: 54-55, 1958. The limits between classes are as in *Soil Survey Manual*, U. S. D. A. Handbook 18, 1951.

Textural Podzol subgroup—In this subgroup are Podzol soils that have a Bft horizon, the accumulations being organic matter, sesquioxides and clay. The organic matter and free sesquioxides decrease rapidly with depth. The clay content increases appreciably from the Ae to the Bft horizon, increases slightly in the Bt2 or Bt3 horizon and is about as high in the C horizon as in the Bt2 or Bt3 horizon. The solum is acid.

Till—That part of the glacial drift deposited directly by the ice with little or no transportation by water. It is generally an unstratified, unconsolidated, heterogeneous mixture of clay, silt, sand and gravel, and sometimes boulders.

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